WORK

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A PLAIN CABINET BOOKCASE.

BY DAVID ADAMSON.

GENERAL CHARACTER AND STYLE OF BOOKCASE — DIMENSIONS.

TURNING over in my mind which of various articles of furniture will be most suitable for description without being able to arrive at any decision, and giving expression to my thoughts, a voice from one who is near and dear to me suggests that "our" bookcase would be a good subject. As the question with me had almost resolved itself into a tie between the bookcase and something else, it requires only a hint to turn the scale in favour of the former. The other will be described in due course.

I do not know that anything need be said about the delights of a well-filled bookcase, for in these days of cheap literature, those who have any taste for reading know the pleasure which is derivable from a bookcase—or, rather, from its contents. It may, however, be suggested that even a bookcase can be put to other uses than its nominal one, for the lower cupboard, having wooden panels in the doors, may be made available as an enclosed sideboard, the upper portion, with glass doors, being reserved for books. The cabinet bookcase is, indeed, contrived "a double debt to pay," if desired: a thing for use rather than for ornament alone. The contents are the decorations, but they must not be spoiled in appearance by an ugly setting.

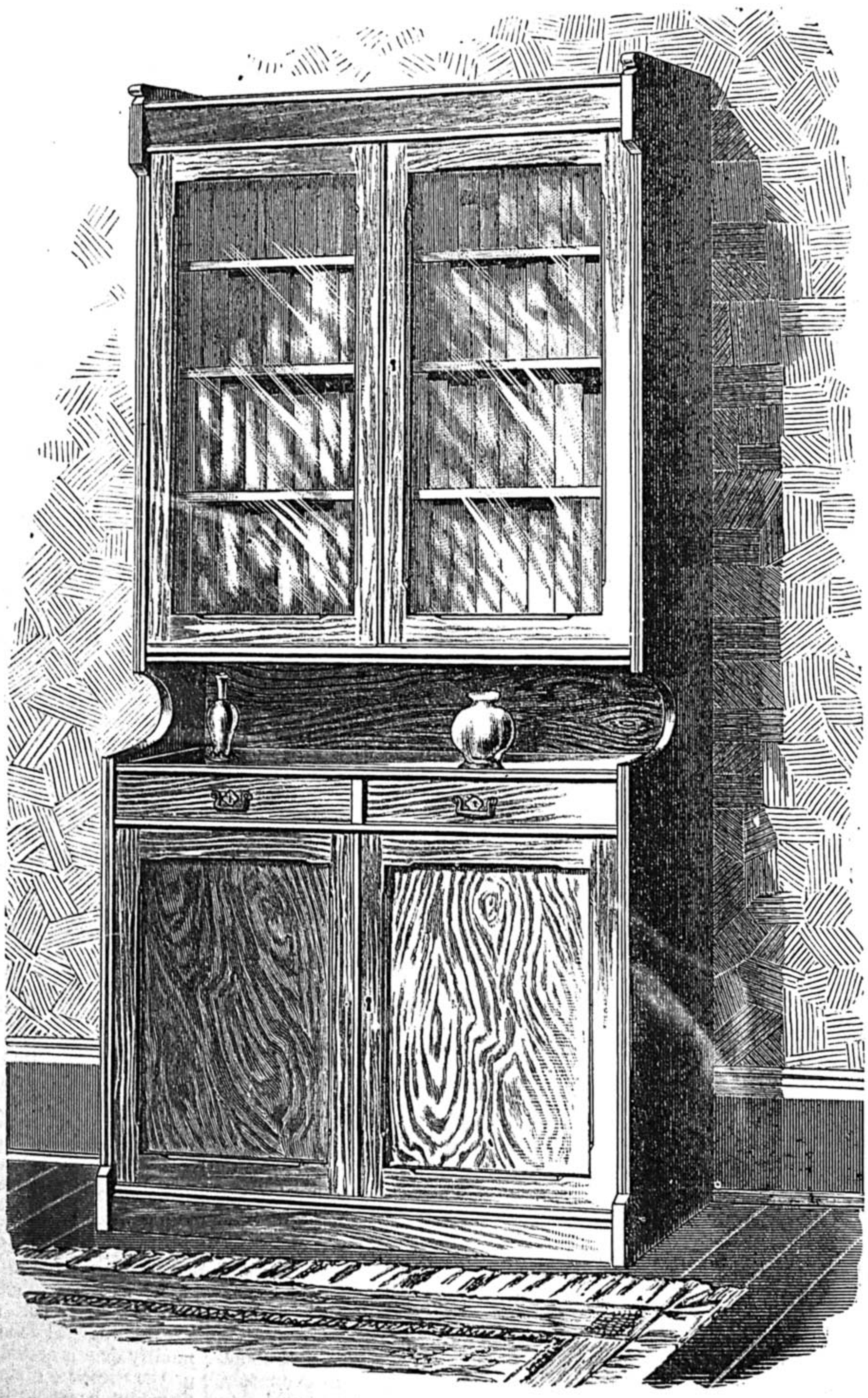

Fig. 1.—Perspective View of Bookcase.

Of course, in the drawing the bookcase looks so plain as to be almost bordering on ugliness; but then, in the drawing we have not the marvellous ever-changing play of reflected light which, in itself, forms an important feature in any piece of polished woodwork. I do not now speak about figure or variety of texture in the wood, for as it happens, in this particular bookcase it is ebonised or blackened, so that the surface is uniform. The play of light to which reference has been made is, therefore, an important feature—though may-be an accidental one—in the decorative effect of any plain piece of furniture. The same remark applies to any woodwork painted in self-colour without graining. I am tempted to enlarge on this a little, as I am convinced that comparatively few people have given the subject the attention it deserves. Of course, to treat it in these pages — devoted, as they are, to purely practical work—from a scientific point of view, would be somewhat out of place, and perhaps it is scarcely necessary to do more than allude to it. We may be unconscious of the effect—or, let me say, of why the effect — is produced on us when we view a piece of plain furniture. It may have looked nothing in the drawing, absolutely nothing but an orderly

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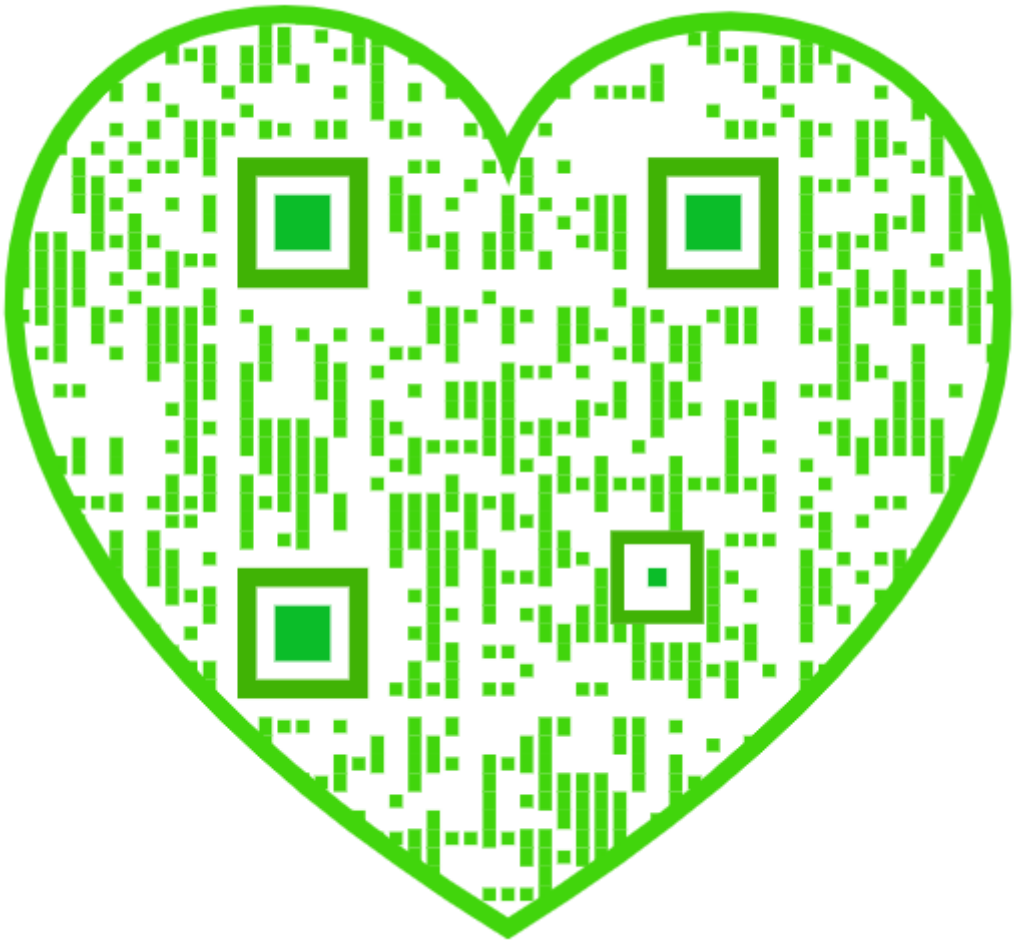

arrangement of straight lines; yet, when the thing is made no one seems to think it so very plain, after all. Why? Simply because the texture—if I may so call it—of the smooth flat surfaces is not monotonous. As we ourselves alter our position, so does the quality of the colour vary. But perhaps some may say, If the thing is black, it always looks black; and, without contradicting them, I would merely suggest that they should make a practical trial with such a thing as an ebony round ruler. True, it is black, but a long line shows white, or it may be only grey if the polish is dull and the light the same; still, whatever it is, it is lighter in appearance than the part which is in the shade or away from the light. You don't see it: you don't see the light, I mean. But surely you see the shine in one part? Yes. Well, that is the reflected light, which I claim plays such an important part in all plain furniture. Call it shine or reflection—it does not matter which—the fact is the same. Even if we would, we cannot—even in such artificial things as articles of furniture—annul the beauties which Nature lavishes on us, though we may ignore them through mental blindness—or, worse, through wilfully refusing to see them. Instead of acknowledging that the chief charm about a plain undecorated wooden contrivance is due to the natural effect of light, we are, perhaps, rather too apt to attribute it to the artistic skill of the designer. I sometimes think we strive rather too much after effect in our furniture, and so, by our efforts, defeat the ends in view. However, this is merely a suggestion, which, though it is quite consistent with the fact that plain furniture is not often considered ugly—indeed, more often is considered æsthetic (I use the word in its true sense)—may not meet with universal approval; but I trust enough has been said to show that the bookcase in question is agreeable to look at. Of course, tastes vary, and it is not to be expected that it will please all; but remembering that the furniture described is, as the title states, easily made and cheaply produced, no great scope is available for mere decoration. This must give way to utility and soundness, for, whatever else is sacrificed, these two qualities should not be. It is owing to neglect of this fundamental principle that we see so much bad work. There is too much attention paid to mere ornament, and too little to honest construction. Of course, ornamentation is all very well in its way, but the cost of production is increased thereby, so that, when decorative details are a *sine quâ non*, something must be sacrificed. Unfortunately, this something is too often structural. In the bookcase under consideration nothing whatever has been thrown away on decoration. It is simply a useful piece of furniture, which its very homeliness invests with an attraction not always found in more pretentious work.

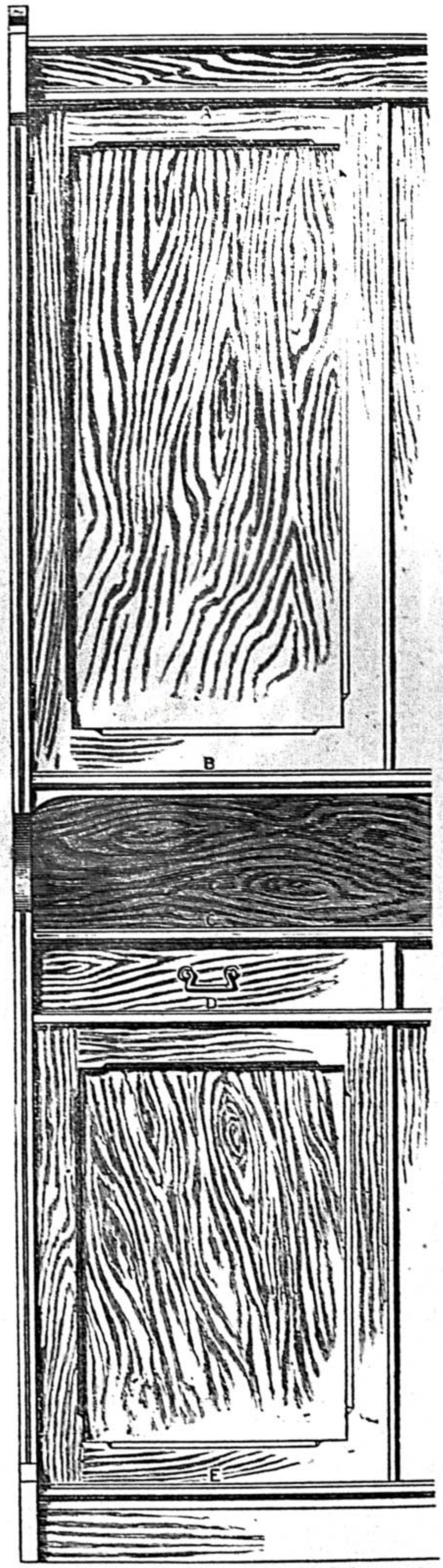

Fig. 2.—Front Elevation (letters show corresponding parts. Scale 1 in. = 1 ft.).

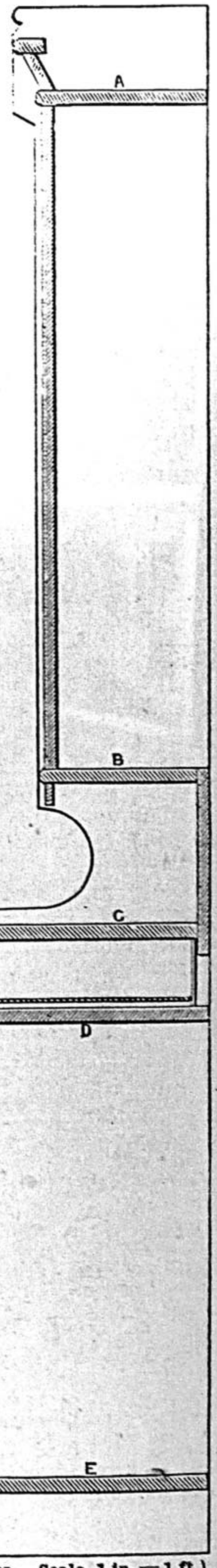

Fig. 3.—End Elevation.

By Fig. 1, which represents the bookcase pictorially or in perspective, it will be seen that the ends are flush from top to bottom; there is no cornice at the top, nor plinth at the bottom, projecting from them. The reason for which is, that the bookcase was originally made to fit into a recess, and cornice or plinth would have prevented its ends fitting close to the wall at the sides. As much space as possible was wanted in the bookcase—or, in other words, it was wanted as large as it could be. To have made a cornice in the usual way would have rendered it necessary to reduce the width of the carcase, or body, of the case some three to four inches. By adopting the straight ends, this additional space is gained, and, moreover, a piece of furniture made so can be closely fitted within the space intended for it. A bookcase made in the ordinary way with cornice might be placed within a recess, but can scarcely be said to fit. But perhaps it may be thought that such a formation at the top would be unsightly if the bookcase is to be placed against a flat wall instead of in a recess. If so, I can only say that the appearance is merely a matter of opinion, and that, personally, I see no reason why a bookcase or similar piece of furniture—such as a wardrobe—should have, of necessity, a moulded cornice on the ends. Those who think they would like to have a cornice will have no difficulty in forming one according to the method described for the overmantel shown in Vol. I., page 25. If, by the way, the two things are to be in the same room, it will be just as well to keep to the same general features in any cornice that may be adopted.

In the meantime, as it is the earnest endeavour that this series of furniture should be as widely useful and suggestive as possible, let it be supposed that the bookcase is to be made as described. If any worker of average intelligence should then be unable to modify details according to his special liking or the necessity of individual cases, it will, probably, be owing to his not having given sufficient attention to the subject.

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As Fig. 1 gives a general idea of the bookcase, Figs. 2 and 3 will be at once recognised as the front and end elevations, which are almost self-explanatory. In order to economise space, only a little more than one-half of the former is given—just sufficient to include the division between the two drawers. The other half, of course, is identical, the division between the drawers, or, the same thing, the edge of the doors, being the central line. As these diagrams are drawn to inch scale—*i.e.*, each inch in them represents 1 ft. of actual measurement with a pair of compasses and a rule—it will be easy to see that the dimensions over all are as follows:—Height, 8 ft. 4 in.; width, 4 ft.; depth from back to front on upper part, 11 in.; depth from back to front on lower part, 1 ft. 4 in. To the top of the drawers the measurement is 3 ft. 5 in., the open space above them being 9 in. high. A bookcase made to these sizes will be found a very useful one, space permitting; but before going any further, a few general remarks, for the benefit of those who want to depart from them, will not be amiss. As every one must be aware, bookcases are made in almost any size, but one to the design given could hardly be made either much larger or smaller without modifying the details very considerably. It would not do, for example, to make the bookcase as shown 6 ft. wide, for the simple reason that two doors in such a width would be not only inconvenient, but unsightly. It would be altogether better to have three, but as it is beyond the present purpose to describe a 6-ft. bookcase, nothing need be said about the arrangement.

Perhaps it may be as well to explain, for the benefit of all amateurs, that the size of a bookcase is ordinarily understood, technically, to refer to its width only, other dimensions being either understood, or, if exceptional, expressed in figures separately. Thus when we speak of a 3 ft., 3 ft. 6 in., 4 ft., or any other sized bookcase, none but those unacquainted with furniture would understand that the measurement referred to anything but width across front. But reverting to sizes for which our design is suitable, let it be said that 5 ft. is the utmost. Even this will be fully large for it, and, unless for particular reasons, 4 ft. 6 in. will be better for the limit. For smaller sizes than 4 ft., we are not bound by the same considerations, though it will need very little perception to see that if made much less one drawer will be better than two. Roughly speaking, I should advise only one drawer for a bookcase, not more than or anything under 3 ft. As it is in 4 ft. size, it may have only one drawer without this being very unwieldy. Perhaps this will be as appropriate a place as any to suggest that, if desired, the drawers may be omitted altogether, the lower part then being a plain cupboard only. If made without drawers, the top of the cupboard may with advantage be a little lower than the height named for it. For a very small bookcase, *i.e.*, one not exceeding 2 ft. 6 in., one door instead of two to each portion would be an improvement, but such a narrow case is so seldom wanted that this may almost be left out of consideration.

With regard to height, it need only be said that 7 ft. 6 in. to 8 ft. 6 in. may be regarded as suitable, and that the measurement to the top of the drawers is rather more than usual, owing to large cupboard accommodation having been required.

The depth from back to front of the top portion will, of course, be determined by the size of the books to be placed in it, and remembering that almost 1½ in. will have to be deducted from the available space for these—or, as it may otherwise be stated, that the width of the shelves will be 1½ in. less than the depth of the end—these may seem too small for large books. The shelves will be 9½ in. wide, and this will take a good-sized book: for instance, WORK.

Have I forgotten the back of the bookcase, as no allowance has been made for it when giving the width of the shelves? No; for the simple reason that there is no back. The wall against which the case rests serves for this, so a back as part of the bookcase itself is not part of the specification. But some may object to a bookcase without a back, and, if so, they will surely find no difficulty in putting one on without directions how to manage it. I may, however, remind those who think the bookcase will look incomplete unless the back is enclosed that when the books are in nothing can be seen there. The open space between the upper and lower cupboards may seem an innovation to some readers who have been accustomed to see bookcases as they are usually made, with the upper portion immediately above the lower. Though not so commonly met with, bookcases with recess, as in our model, occupy a regular place in furniture, and, even were it not so, there is no good reason why this arrangement should not be adopted. Everybody knows that the lower cupboard of a bookcase is usually deeper from back to front than the upper, so that there is a narrow space in front of this on which anything may be placed. As, however, the glass or upper doors swing within an inch at most of this shelf or top, they cannot be opened unless it is cleared. Of course, those who regard their books merely as ornaments, and seldom take them down, will not regard this as an objection; but people who are in the habit of constantly using their bookcase do not care to be always removing and replacing the odds and ends which lie on the projecting top. Perhaps it may be said, Why have such things on it at all? and it must freely be conceded that without them the objection, slight as it may be, cannot be urged. The ledge, however, forms such an apparently suitable place for a few nicknacks—specimen glasses holding a flower or two, or such-like things, with which one cannot very well find fault—that it is generally encumbered. By raising the glass doors to a good height, and leaving a space between their lower rails and the top of the cabinet, or lower cupboard, we can get to the books without disturbing anything on it. The wide open shelf, however, is convenient for many purposes, both useful and ornamental, so that nothing more need be said in its favour. On the other hand, it might be, and sometimes is, objected to on the score of the enclosed space for books being curtailed. That it does reduce the accommodation behind the doors cannot be denied, and it must just be for the maker—or, rather, for the users—of the bookcase to decide which form he, or she, will find the most useful. Both are good, and I do not wish to at all imply that one is in any way better than the other. Each has advantages of its own, as I have endeavoured to point out for the consideration of those who may find the suggestions helpful, and having said this, we may proceed to the construction of the bookcase, taking it first as it stands, and then giving whatever suggestions may seem necessary for alternative details.

BRICKLAYERS' WORK.

BY MUNIO.

ARCHES.

AN arch may be defined as a curved beam composed of wedge-shaped materials, the joints of which are so constructed, that by their mutual pressure the weight is distributed throughout the whole of them. It is, therefore, important in designing an arch that its form, and the materials of which it is composed, should be carefully calculated in respect to the weight which is to come upon it.

The lowest point in an arch is called the springing, and the highest the crown; the under-side is called the soffit, and the centre brick at the top the key; the supports from which the arch springs are called the abutments; and when a number of arches are in a range, the pillars supporting the centre arches are called piers; sometimes the arch bricks are called voussoirs, the lower part of the bricks the intrados, and the upper part the extrados. Arches are built of various forms; those used in brick-work are generally semi-circular, segmental, camber, Gothic, elliptic, and elliptic Gothic. The semi-circular arch is half a circle; the segmental a portion of a circle less than half; the camber is very slightly curved on the underside; the Gothic is struck from two centres; the elliptic is half an oval; and the elliptic Gothic is struck from four centres.

Arches executed in brick-work are plain arches, cut arches, and rubbed and gauged arches.

PLAIN ARCHES.

Plain arches are those in which the bricks are not cut or moulded to the radius of the arch. Arches of large span, bridges, vaultings, &c., are executed in this manner. These arches are built in half-brick courses which are not bonded together, the number of courses being proportioned to the load the arch is to sustain. The centres for these arches should always be set on double wedges, so that they can be slacked as soon as the arch is keyed and backed up, in order that the joints may settle before the centre is finally removed; the brick-work should be made of uniform thickness, for it is evident that if one course has thicker joints than another, there will be unequal settlement, and the arch will be thrown out of form. After the centres are removed, the joints in the soffit are raked out and pointed.

The arches of bridges, and other work exposed to the weather, generally have a covering of asphalt spread over the crown of the arch, to prevent water soaking through and washing the mortar out of the joints.

When culverts or barrel arches are built in embankments, or where earth is to be tipped on them, the arch should be backed up solid to the level of the crown, and a good depth of earth should be barrowed on the top and at each side, as, if the embankment is tipped directly on them, the arch will be crushed out of shape or broken in.

Arches for fire-proof floors are turned in half-brick courses between iron girders, then backed up level with the crown, and the floor laid upon them, as shown in Fig. 33. These floors are also constructed in one solid mass with Portland cement concrete, iron rods being fixed across them at intervals to tie the whole together.

Trimmer arches are also turned in half-brick courses, a springer is nailed to the trimmer joist, and the arch is turned from this to the chimney breast, backed up level, and the hearth laid upon it; this method is

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much less liable to fires than laying the hearths in wooden boxes: the joists should be strutted and bolted together, to prevent the arch forcing the trimmer joist away from the breast.

CUT ARCHES.

Cut arches are those in which the arch bricks are cut to a mould made to the radius of the arch by means of the brick hammer and chisels; they can therefore be set with much thinner joints than plain arches, generally about $\frac{3}{16}$ in.; the bricks are sometimes cut before being burnt, and when burnt, are pared, to remove any inequalities caused by burning; they are also called axed arches.

RUBBED AND GAUGED ARCHES.

Rubbed and gauged arches are those in which the bricks are first cut and then rubbed till they are perfectly true with the mould; the face is first rubbed true on the rubbing-stone, then one bed rubbed square from this; the brick is then set on the bedding stone, and the mould marked on the two faces; the lines are then notched in with the saw, and the brick cut to the lines; the remaining beds and soffit are then rubbed true, and tried on the bedding stone. The arches are set with very fine joints with washed putty, the joints generally being about $\frac{1}{16}$ in. thick. The bricks for this work are specially made, and are called cutters and rubbers.

DRAWING ARCH MOULDS.

In getting out the moulds for arches a large drawing-board or table is required, large square, straight-edge, and set square, beam compasses and ordinary compasses; a lath, with a pencil fixed at one end and a bradawl for centre, may be substituted for the beam compasses.

SEMI-CIRCULAR ARCH.

Draw the springing line A B (Fig. 34) and find the centre, C, then with the radius C A draw the semicircle A G B; set off the depth of the arch A E, and with the radius C E draw the outer semicircle E D F; draw C D at right angles to A B, and mark half the width of the key on each side of D, then divide the remainder of the outer curve into equal spaces, the same size as the key, and draw lines between the two curves, from these points radiating to the centre C. A mould cut to one of these spaces will form the mould for the arch bricks. If the outer curve does not divide equally from the key, it must be reduced a little, so as to take an extra brick in; one half only of the arch need be drawn, both sides being alike. These remarks will apply to all other forms of arches. Sometimes a circular window is inserted in a gable; the moulds for this are obtained in the same manner, except that four keys are set out: one at each side of the springing, and one at the top and bottom, and the remaining spaces divided as before. In cutting the mould the thickness of joint must be allowed for.

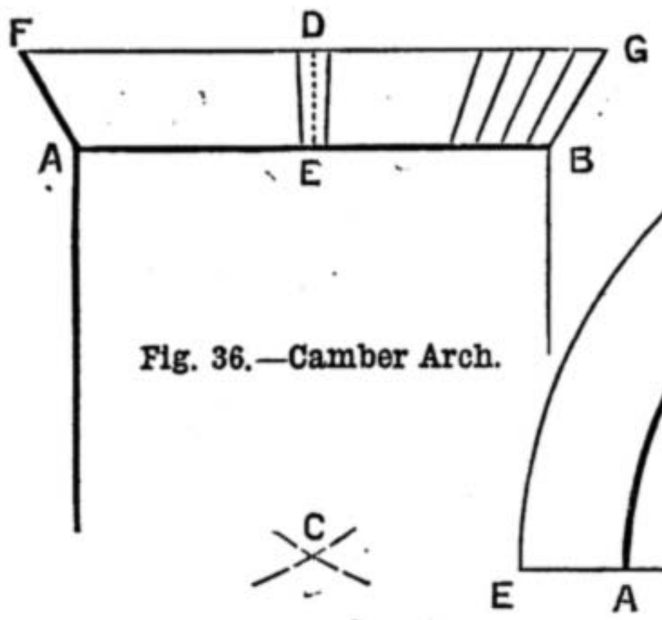


Fig. 36.—Camber Arch.

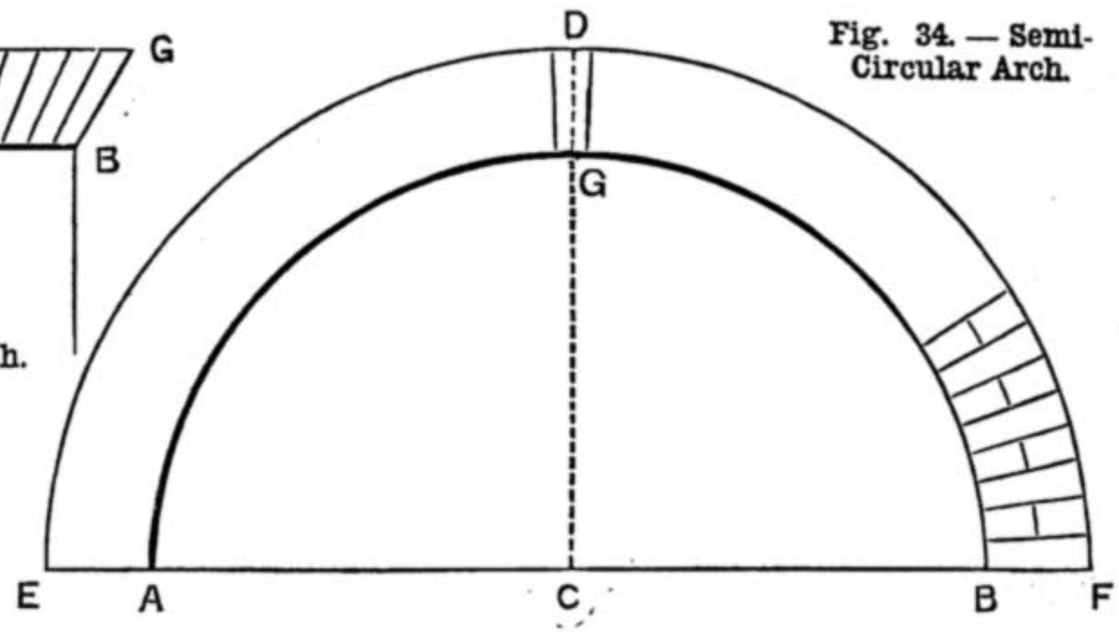


Fig. 34.—Semi-Circular Arch.

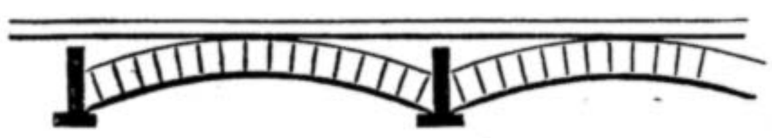


Fig. 33.—Fire-Proof Floor.

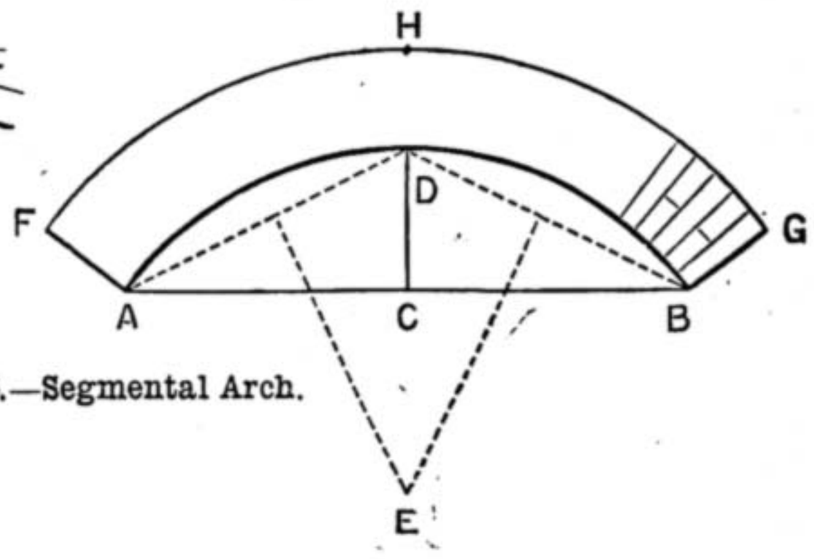


Fig. 35.—Segmental Arch.

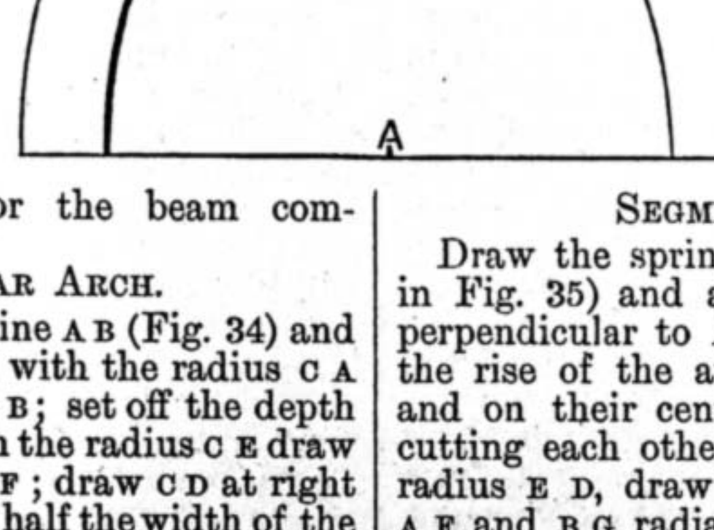


Fig. 40.—Semi-Circular Arch with Gothic Head.

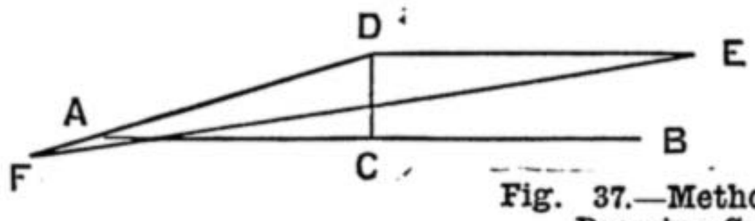


Fig. 37.—Method of Drawing Camber Curve.

Fig. 39.—Gothic Arch.

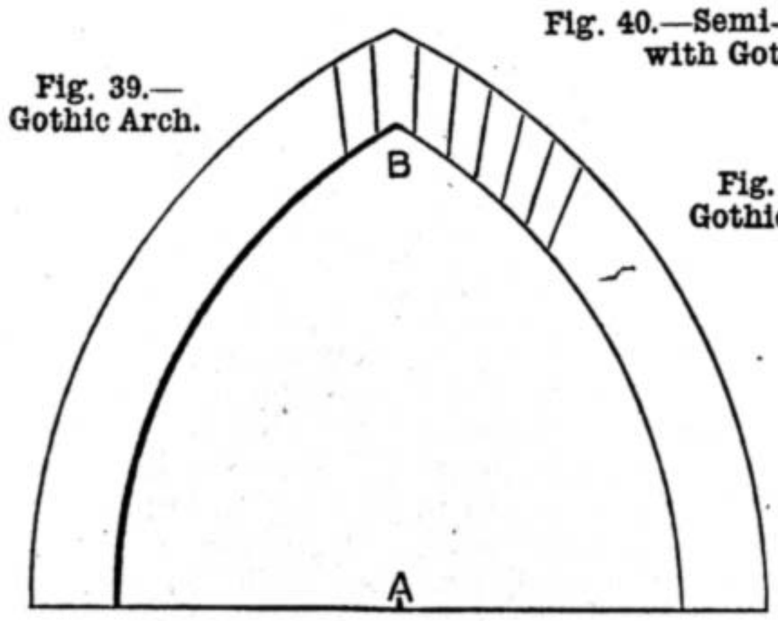
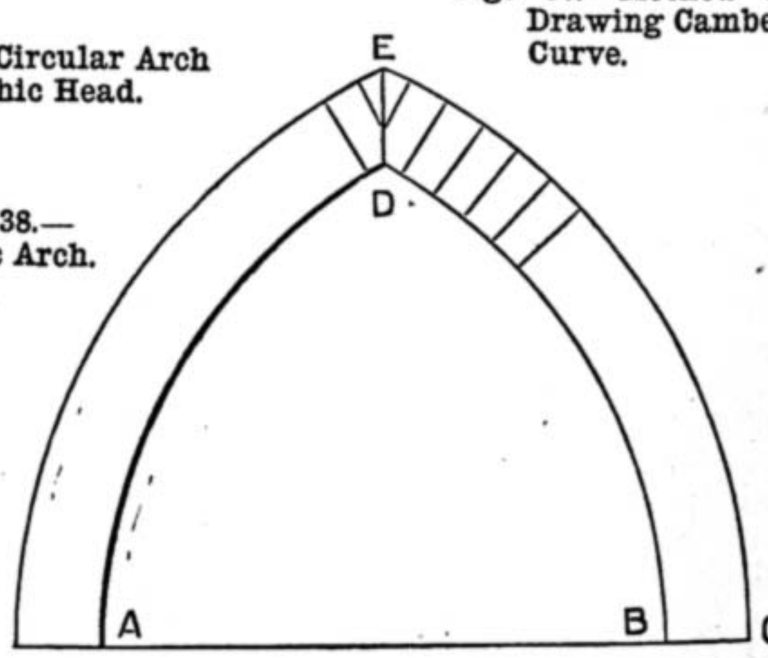


Fig. 38.—Gothic Arch.



SEGMENTAL ARCH.

Draw the springing line A B (as shown in Fig. 35) and at the centre C draw C D perpendicular to A B, making C D equal to the rise of the arch; join D A and D B, and on their centres draw perpendiculars cutting each other in E; from E, with the radius E D, draw the curve A D B; draw A F and B G radiating to E—which are the springing lines or skew-backs. Make A F equal to the depth of the arch, and from the point E with the radius E F draw the outer curve F H G. Set off the key on each side of H D, and divide the remainder of the curve into equal spaces, the size of the key, as before described.

CAMBER ARCH.

Mark the width of the opening A B (Fig. 36), and with the radius A B, and the centres A and B, draw arcs intersecting each other in C; draw A F and B G radiating from C, which will form the line of skew-back; set off the height of the arch, and draw the top line F G, then with the camber slip draw the soffit line A E B; if the camber slip is not at hand the curve may be drawn in the following manner, as described by Mr. Nicholson in his work on arches; draw the springing line A B (Fig. 37), and mark C D equal to the rise of the arch; draw D E parallel to C B, making D E longer than C B, draw D A F equal to D E, and join F E; cut a mould to the triangle F D E. Fix a bradawl at A, D and B: lay the sides D F and D E against the bradawls at A and D, and with a pencil point fixed at D, trace half the curve from D to A; move the mould against D and B, and trace the other half of the curve; this method may be used for any curve of long radius. Having drawn the curve, set off D E (Fig. 36) perpendicular to the springing line, and mark half the key on each side, and draw lines radiating to C, cut a mould to these lines, making it 3 in. longer at top and bottom, and mark the soffit line on the mould; lay the mould against the line of key already drawn at one side, keeping the mark against the soffit line, and mark the next joint; move the mould to this joint, and mark the next, and so on till the whole are marked, keeping the soffit mark on the mould in each case against the soffit line on the drawing board: if the last brick does not fill out to the skew-back, the mould may be lowered a little for the last two or three bricks, or the key may be made a little thinner, so as to fill out with an extra brick. It will perhaps be advisable before marking the joints to try the mould right through, so that if it does not fill out the lines will not need rubbing out. The bricks are cut to the mould, keeping the soffit mark to the longest corner of the brick, and marking the soffit line and top line on the bricks by means of a bevel, set to the marks on the drawing board. Half the arch only need be drawn, and allowance must be made for the joints.

GOTHIC ARCH.

Set off the width of opening A B (Fig. 38), and with the radius A B, and A as centre, draw the arc B D, and with the same radius

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and B as centre, draw A D; set off the depth of the arch B C, and with the radius A C, and the same centres, draw the two outer curves. Draw D E perpendicular to A B, and set off on each side half the thickness of key, and divide the remainder of the outer arc into equal spaces the size of the key, and from these points draw lines between the two arcs radiating to the centre A; one of these divisions will be the mould. Sometimes the whole of the joints are drawn to the centre A (Fig. 39), but when so drawn the arch is not so strong; the key at B is called a bird's-mouthed key.

Sometimes a semicircular arch is finished with a Gothic head outside (Fig. 40). In this case the soffit or semicircle is divided equally, and the joints drawn to radiate to the centre A, the key being set off in the centre.

Two pieces of quartering not less than 2 in. by 2½ in., and of sufficient height to reach from the floor to at least 3 ft. 6 in. above the lathe bed.

A piece of 1½ in. by 2 in. stuff, about 5 in. longer than the lathe bed.

A few feet of ¾ in. stuff, in strips about 2½ in. wide.

A length of ½ in. iron gas-pipe (internal measurement).

A few odd pieces of some hard wood, about 5 in. square and 1 in. and 1½ in. thick, four iron brackets, and half a dozen old Venetian blind laths.

The above will cost but a trifle if it has to be purchased new, but many readers would have little difficulty in obtaining the larger portion at the price of carrying it home.

The material to hand, we will begin by turn up all the discs between centres, making a V-groove on one of the end discs to receive the cord from the driving wheel.

The frame on which to build up the cylinder is now ready for the laths; these must be cut into strips about 1 in. wide, and nailed on to the discs, as shown in section in Fig. 1. On the two outside discs three nails should be used to each strip (gimp pins are best), so as to bend the strips as nearly as possible to a curve (as shown at A, Fig. 1); but on the others put only one nail in the centre (as in B, Fig. 1), and it will be found that the projecting edges of the joints will offer a better hold for the driving cord than a smooth round surface would.

Now take some of the 2½ in. by ¾ in. stuff, and make a frame about 18 in. deep, and wide enough to take the pulley cylinder

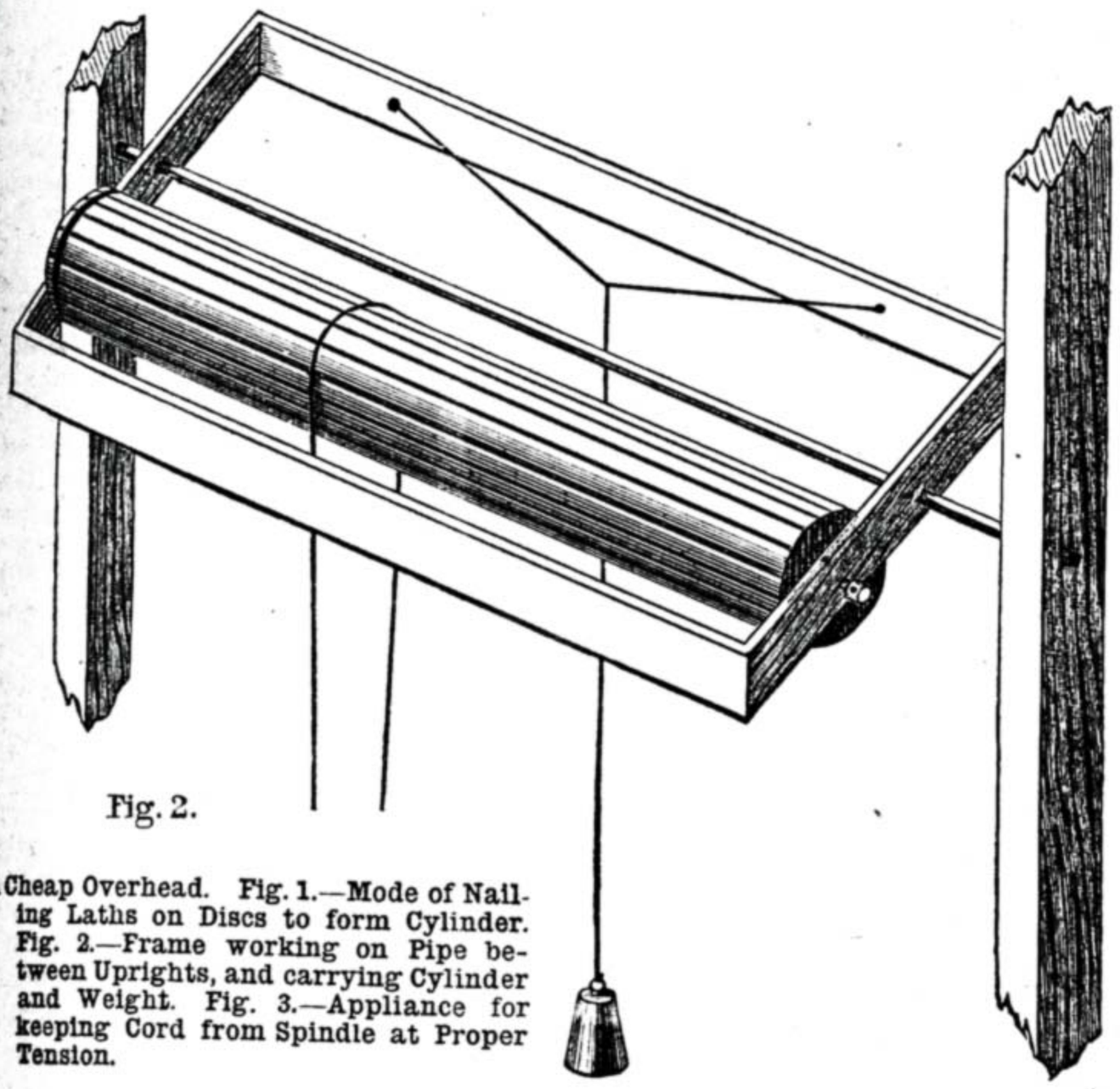

Fig. 2.

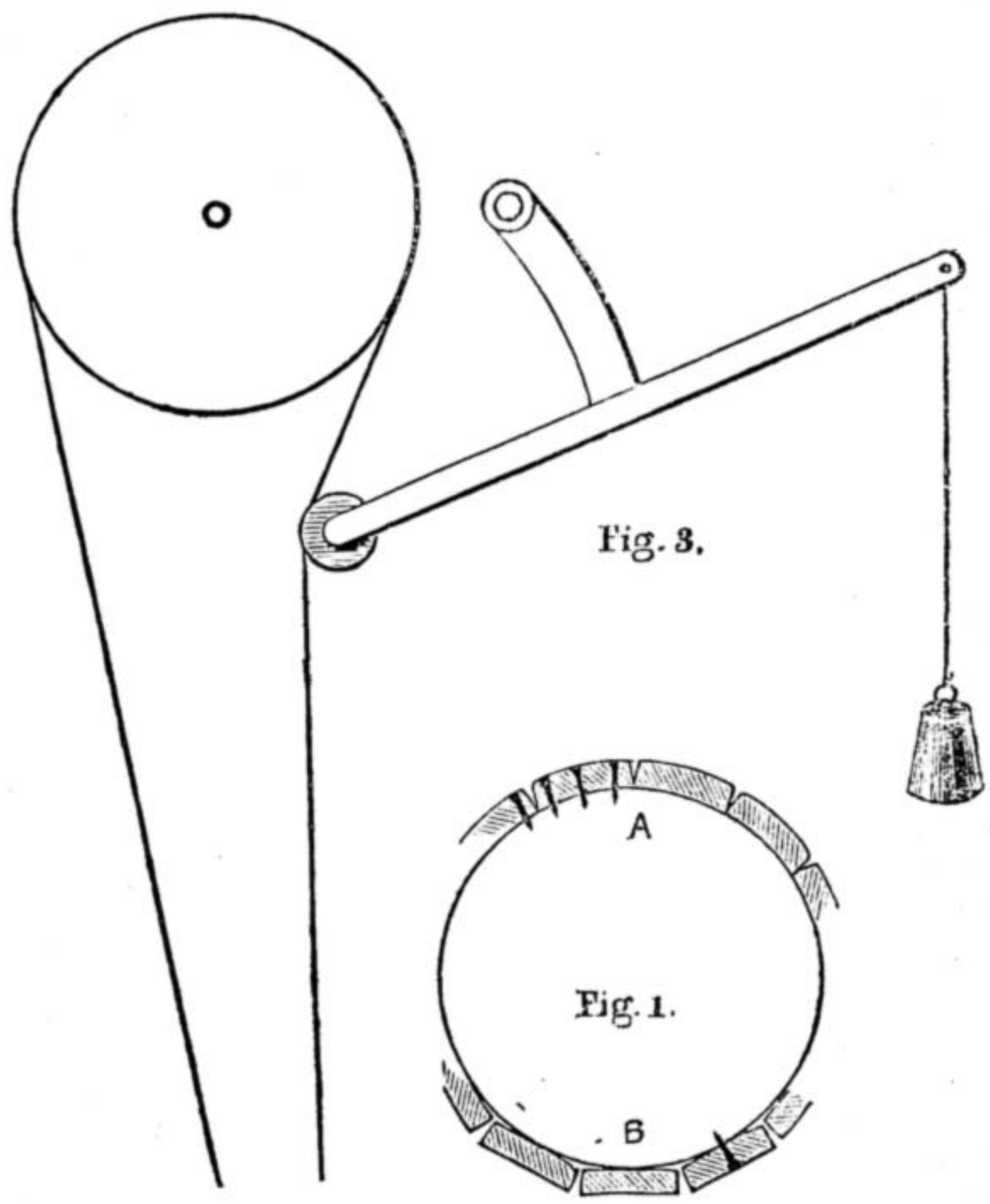

Fig. 3.

Fig. 1.

A Cheap Overhead. Fig. 1.—Mode of Nailing Laths on Discs to form Cylinder. Fig. 2.—Frame working on Pipe between Uprights, and carrying Cylinder and Weight. Fig. 3.—Appliance for keeping Cord from Spindle at Proper Tension.

A CHEAP OVERHEAD.

BY H. A. MILES.

No amateur's lathe can be termed complete unless it is fitted with overhead motion, and though the addition of this apparatus usually adds a few pounds to the initial cost, it does not by any means follow that the humble amateur unable to afford this outlay is necessarily to be deprived of the pleasure gained by such a valuable addition to his lathe.

The intention of the writer is to show how an efficient overhead motion may be added to any lathe at the cost of a few shillings at the outside.

Overhead motion, however, is of but little use unless the lathe has a slide rest and a division plate. True, a hand tool is sometimes employed, but it can only be used for boring or cutting rosettes, and is unsatisfactory even for the simplest work. With a drilling spindle in the slide rest, however, the range of the tool is vastly increased. Fluted work, such as is seen in table legs, rosettes, and perforations, are but a few of the ways in which plain turned work may be enriched by this means.

For the construction of this apparatus the only material required is enumerated below.

erecting the two uprights, one on each side of the tool-board, and about 3 in. behind the lathe bed; these should be firmly screwed to the tool-board, and bound to the iron standards near the floor by strong wire or hoop iron. A cross-piece must now be fixed a few inches from the top; this may be screwed on or fitted tightly between the uprights, and fixed with brackets. The best way, however, if the maker is a carpenter, is to mortice them together before fixing up.

Now cut a piece of gas-pipe of sufficient length to pass through holes bored in the uprights about 2 in. below the cross-piece. This is the pipe on which the overhead frame swivels.

The length of the pulley will have to be governed by the capacity of the lathe: thus a 3 ft. bed would take about 2 ft. between centres, and this would be found quite sufficient for all purposes.

Cut a piece of pipe the full distance between centres, and bore holes through the centres of the pieces of hard wood, which must be roughly fashioned to a circle, and then rammed on the pipe, one an inch or so from either end and intermediate pieces about every 6 or 7 in. If these fit loosely a cut nail may be driven in between the disc and the pipe, which will key them up tight.

Put a carrier on one end of the pipe and when swung on two steel-pointed screws driven through the sides of the frame; a glance at Fig. 2 will show how this is made. The corners are strengthened by iron brackets. Half-way on each side bore a hole through which you can easily pass the iron pipe you put through the uprights, and half-way between this and the front put the steel-pointed screws on which the cylinder revolves.

The cord from the driving wheel is kept tight by means of a weight, w, suspended from the hind part of the frame.

The cord from the spindle in the slide rest to the overhead is kept at the proper tension by the appliance shown in Fig. 3.

This is merely a piece of wood with a pulley at one end which presses against the cord, and a weight at the other connected half-way to a perpendicular piece which hinges on the iron bar (a piece of tin plate bent over the bar and nailed to the wood effects this). The apparatus is now complete, and if the weights are properly proportioned, will be found as effective as many at a much higher figure.

The weights, which may be any old castings or scraps, should be suspended at a short distance from the floor, so as to make little noise if the cord breaks.

The best material for the latter is lathe

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cord, about fifty yards being sold for 2s. 6d.; this can be neatly spliced, thus preventing undue jumping over the pulleys. If a cheaper material be preferred, white linen blind cord, twelve yards for 6d., is very serviceable, and can be joined by laying two ends together and binding with wire; the edges must not be overlapped, and then bound, as it would make the spindle jump, even if it did not get off the pulley with every revolution.

I think I have made the description plain, but if any difficulty should be found I will reply to querists through medium of "Shop."

PRACTICAL DETAILS OF BOOKBINDING.

BY GILBERT CLARKSON.

TREATMENT OF EDGES — SPRINKLING, MARBLING, GILDING, ETC.

THE next operation of any importance in bookbinding is the treatment of the edges, and this admits of so much diversification, that were I to go into detail respecting the edges which I have seen in my day I could fill a volume. It will be sufficient to give a general idea of the most common styles, dwelling more particularly on the two most important, viz., gilding and marbling. In colouring the edges equally over as for red edges, the book must be knocked up even at the head and laid on the edge of the press or table, the left hand holding it tightly to prevent the colour running in. The colour should be applied with a small sponge passed evenly towards the back one way, and the fore-edge the other, to prevent the colour forming in a mass at the back or fore-edge. The tail of the book is treated in the same manner as the head. For the fore-edge the boards will have to be thrown back and a cutting board held firmly above. The colour is more liable to run in at the fore-edge, therefore a little more care will be necessary. If a number of volumes are to have the same edge, they can be done by simply placing them one above the other. Sometimes binders put their books in the lying press when colouring them as a precaution against the colour running in. But I do not think this necessary.

For sprinkled edges the books may be tied up, or simply placed the one above the other. The best method of applying the sprinkle is to use a large brush similar to a painter's, dipped in the colour and knocked against the press-pin until the sprinkle becomes fine. The edge is then sprinkled by beating lightly at first, and stronger as the brush gradually loses its charge of colour, being careful that the spots are as fine as possible. I have seen binders sprinkle with a riddle and boot brush, holding the riddle over the book, rubbing the brush vigorously backwards and forwards, causing the sprinkle to pass through the riddle upon the edge below. Whether they thought this method a clever one, was always a *riddle* to me. My own opinion is, that it is a very stupid method, entailing a great amount of unnecessary labour. Another plan, but one I cannot recommend, is this:—A small brush like a sixpenny gum brush, dipped in colour, is held tightly between the finger and thumb of the left hand near to the end of the hair. The forefinger of the right hand strikes the projecting hair with a movement similar to that employed by a boy when playing a Jew's harp. The brush does not hold much colour owing to the manner in which it is held in the fingers, and the workman is obliged to keep dip, dip, dipping it in the pot every few spots he makes, and in consequence, loses a great deal of time.

One, two, three, or any number of colours may be used to the same edge, and many combinations have a pleasing effect. A great deal depends upon the taste of the workman.

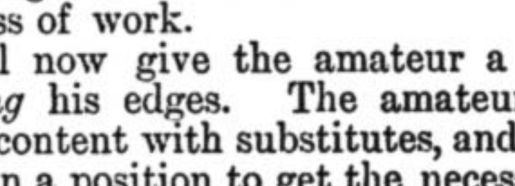

Fig. 23.—Marbling Comb.

Fancy sprinkles are not much used now, so it is not worth while describing them.

A good substitute for marbling, and one which looks much better than sprinkling, is mottling. This is done with an open-holed sponge filled with colour and daubed lightly over the edge, leaving the natural marks of the sponge. The edge may be coloured all over first, or it may be mottled on the white edge alone. Red and black makes a good combination. But this style of edge is not very suitable for letterpress work, it looks its best on heavy account books. It is certainly much more beautiful than some of the outrageous Dutch marbles one sees upon this class of work.

I will now give the amateur a tip for *marbling* his edges. The amateur is not always content with substitutes, and he may not be in a position to get the necessary rig out to do the real thing, and as this comes so near the real thing, to anyone not in the secret it will pass as current coin.

Have ready a few strips of good marble paper—a little larger each way than the edges to be marbled. Screw the book tightly in the press. Dip a broad camel-hair brush into commercial hydrochloric acid (spirit of salt) and pass it quickly over the edge of the book, lay on a strip of marble paper, on the top of which place a sheet of white paper, tap the edge over gently, but firmly, with a binder's hammer. Lift off the papers, and the marble will be found to have been transferred to the edge. This operation requires a little expertness, as the acid will soon dry into the book.

Another ready means of marbling comes to my mind. Take a small portion of any vegetable colour, and grind it on a slab or in a mortar until it becomes very fine. Mix a little of this colour with spirits of wine, and having a vessel large enough to admit the fore-edge of the book filled with clear water, take up some of the colour on a knife, and allow it to flow gradually on the surface of the water. The spirits of wine will cause it to spread in a variety of forms.

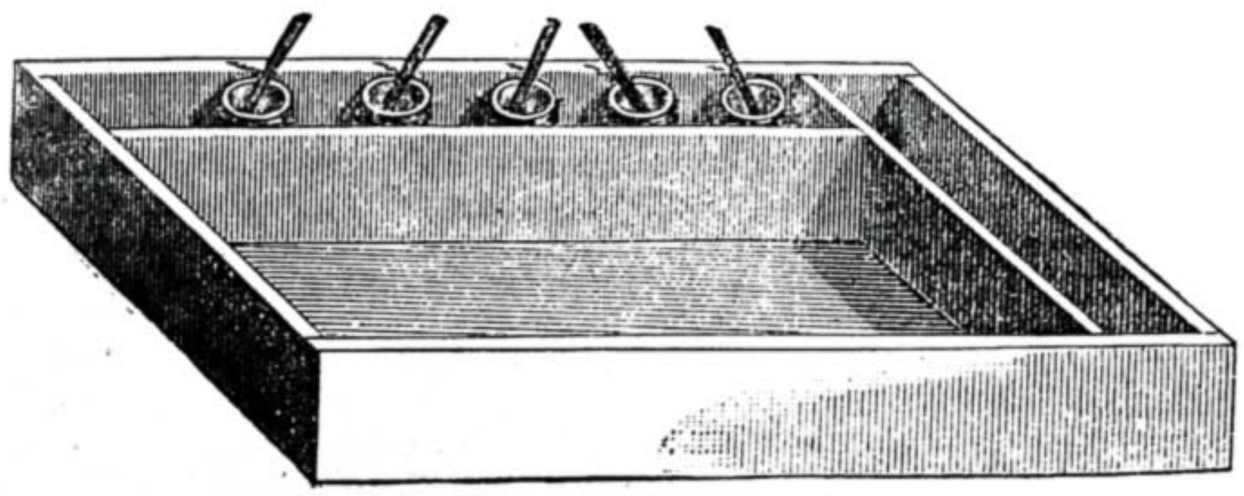

Fig. 24.—Marbling Trough.

The edge of the book may be dipped in, and the result will be a nice clean edge with very little cost.

In most large towns marbling is done outside the binding-shop. Those firms which manufacture and supply marbled and enamelled papers generally keep men for the purpose of marbling edges, and binders are in the habit of sending their books to them. This is a capital arrangement, for it is not always possible for a master binder to keep a man specially for this purpose. Every binder is not a marbler. But I think that no binder, if he has the ghost of a chance to learn to marble, should allow it to pass without taking advantage of it, and for this reason I will try to be as explicit as possible in describing the process. Every detail must be carefully carried out, for if any part be faulty it will be impossible to make a good marble.

The following articles will be needed:—A shallow wooden trough (Fig. 24), a little round stick, a scraper, combs of various widths (Fig. 23), separate cups and small brushes for each colour, and other preparations, a small marble slab and muller for grinding a little colour in an emergency. The slab will be little needed, for colours can be had ready ground in air-tight jars. These, besides being cheaper, will be found to give much more satisfaction than hand-ground colours.

The size should be made with the best gum tragacanth dissolved in soft water. The usual way of making it is to put a few handfuls into a large deep vessel, such as a pail, and allow it to steep overnight. It should then be well beaten up until the whole of the gum is dissolved. A bundle of light canes tied at one end is kept for this purpose. It must be strained through a very fine sieve and should be as thick as buttermilk.

Oxgall and spirits of wine will be required to mix with the colours to cause them to spread upon the surface of the size, and to make them assume the desired pattern.

All being ready, the size is poured into the trough, and any air bubbles or froth carefully scraped off with the wooden scraper into the receptacle at the end of the trough partitioned off for this purpose.

The colours which are intended to be thrown first on the size are mixed with a little gall and water. The top colours must have more gall and a drop or two of spirits of wine mixed with them to cause them to spread and throw the other colours into veins. Should they not spread sufficiently, more gall and spirits must be added, and if on the contrary, more colour.

Suppose, for example, it is intended to make a "blue shell" marble. Take some red colour on the brush set apart for that particular colour, and tap it gently on the forefinger of the left hand, allowing the surface of the size to become almost covered, and with the yellow brush repeat the operation. Now take the little round stick, and draw it through the colour from side to side of the trough, this will make the colour take the form of lines. Take the blue brush, which in this case is the top colour, and sprinkle it over the trough as the others, this will force the other colours into veins, making a large blue shell-like spot, finish off with a fine sprinkle of gall and water, this will make a white spot on the edge.

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Marbling is commenced by knocking the book up even at the head, and holding it tightly with both hands near the edge which is dipped into the size. It should be immediately withdrawn, and any size adhering should be shaken or blown off to prevent it running into the book. The tail is dipped in the same manner. The boards must be thrown back and the fore-edge flattened before it can be dipped, and immediately replaced after dipping. The refuse colour is scraped off the trough before fresh colour is thrown on.

Nonpareil is a very common marble. To produce this design, the colours are put on as directed above and drawn into lines with the little stick. A comb is then taken and drawn carefully across the colour from left to right.

Spanish marble is effected by giving the volume a to-and-fro movement while dipping. This causes the colours to appear light and dark at intervals along the edge.

The Dutch is the same as the Nonpareil, but the comb used is much wider.

An infinite variety of marbles might be added, but as the proceedings are almost the same as above described, the marbler will be able to execute any design he may fancy. Experience alone will make him successful. He will have many failures at first. But let him call to mind the lesson he learned while at school—

"If at first you don't succeed,
Try, try, again,"

and summon perseverance to his aid. Failures are but the stepping-stones to success.

Gilding is the next operation to which I would refer. It may be described in a very few words which, when read over, may seem to convey the idea that gilding is a simple matter. Be assured, dear reader, it is by no means so. It is simple enough "when you know the way," to use a vulgarism. It is getting to know the way is the whole trouble. How very interesting it is to watch an experienced gilder at work! Many an hour I have stood. The gold leaf which to the tyro seems to be the most unmanageable thing in the world, is very obedient to his every movement, one would almost fancy it was conscious of the fact that he was earning his bread through its agency. The edges are scraped, black-leaded, and the size applied, the gold leaf laid on and covered with a hot plate to assist the drying with a dexterity which is simply surprising. And, although the whole thing is performed in this sleight-of-hand manner, when the final burnishing is accomplished there is neither patch, crack, lap over, or shaky bit, observable in all the edges. Many a thousand Family Bibles have passed through my hands, and although all this work was paid for by the piece, I am glad to say that I never had occasion to return a single book.

The fore-edge of the book is the first to be gilt. It is screwed up as tight as possible in the lying press, of course it must have been previously flattened between boards placed even with the edge. It must be scraped perfectly smooth with a steel scraper, and a wet sponge, with a little bole, and black lead rubbed over it, brushed dry immediately, and burnished with the agate. The bole gives a deeper appearance to the gilding, and cracks will not be so readily observed as in the case of a white edge.

The gold is next blown out on the cushion, and cut to the required size and lifted on a piece of account-book or note-paper with an even edge. To make the gold adhere to the paper, rub it over the hair of the head and press it gently on the top of the gold.

The size (which should be one part white of an egg to three parts water) must be applied evenly with a large flat camel-hair brush and the gold immediately laid on.

After the edge is dry, it should be rubbed down before burnishing, and any defects remedied.

The rubbing down is performed by placing a piece of account-book paper on the edge, holding one side of it with the fingers of the left hand, and burnishing the edge lightly, moving the paper up and down to see how the work is progressing. After this has been successfully accomplished, rub the edge with the heel of the hand, or with a piece of waxy leather kept for this purpose, and burnish the edge until it is perfectly clear and uniform all over. The head and tail of the book are gilded in like manner and with similar precaution.

Gilding, although a very high class method of treating book edges, can be and is, greatly improved upon. There is, for instance, gilding upon red edges, which goes by the term "red under gold," seen to advantage upon those fine pocket Bibles already alluded to in these articles. Then there is what is termed "tooled edges," and when gold of different shades is used in the tooling a very rich effect is produced. There is also gilding upon marble edges, which, although but rarely seen now, was one time considered the "ne plus ultra" of edge treatment.

BRASS: ITS ANALYSIS.

BY "CHEMICUS."

Brass, practically, is an alloy of copper with zinc, and sometimes small quantities of tin. Occasionally, however, the metals lead and iron are present, the former either as a constituent or an impurity, and the latter always as an impurity.

Before proceeding with the description of the analysis of the alloy, which is based upon the supposition that the afore-named metals, and they only, are present, we would make a few remarks on the ignition of the precipitates. As generally performed, the filter-paper containing the precipitate is dried in the water oven, the dried precipitate detached from the filter-paper, the latter ignited separately, the ash added to the precipitate, and the whole then ignited. In general practice the following method may be substituted:—Fold the wet filter-paper containing the precipitate in the form of a cone, and place in a tared porcelain crucible, so that the base rests on the bottom, while the apex is uppermost. Ignite at as low a temperature as possible, until combustion of the paper is complete, when increase the heat to bright redness.

The above mode of ignition is, however, not possible with all the metallic precipitates, since some of them suffer decomposition upon ignition in contact with carbonaceous matter, such as the filter-paper. One instance only of this will be met with in the analysis of brass, namely, that of the lead sulphate precipitate obtained in the determination of the lead, which becomes reduced to the metallic state. The ignition of this precipitate is conducted in the following manner:—After being thoroughly washed, the filter-paper, together with its contents, is dried, the dried precipitate detached as completely as possible from the filter-paper, and placed in a suitable receptacle. The filter-paper is then rolled up into as compact a mass as possible, encircled a few times with one end of a long piece of platinum wire, ignited in the Bunsen burner, and allowed to burn itself out, being meanwhile held (by the wire) over the mouth of a tared porcelain crucible, destined hereafter to receive the bulk of the precipitate. When the last spark has died out, and not till then, the carbonaceous mass is held in the flame until combustion is complete, which being obtained, the ash is shaken out of the wire cage into the crucible, a couple of drops of nitric acid added to dissolve the reduced lead, and a little sulphuric acid added to precipitate the same as sulphate. The crucible is then gently heated until the acids are driven off, the precipitate added, and the whole ignited to redness, cooled, and subsequently weighed.

Tin.

One, two, or more grammes of the brass, as finely divided as possible, is weighed out into a large conical, covered with strong nitric acid, and digested at a gentle heat until solution is complete. When this is accomplished, to the resulting solution a somewhat large volume—say, three or four times its bulk—of dilute nitric acid—one acid to six water—is added, and the liquid heated to boiling until it is reduced by two-thirds. Twice its own volume of water is now added to the solution, the volume again considerably reduced by evaporation, the liquid diluted with a large volume of water, the whole well boiled for ten to fifteen minutes, and allowed to stand at rest until the precipitate has completely settled. By this treatment the tin is obtained as insoluble metastannic acid. After being allowed to settle, pass as much as possible of the supernatant liquid through a double Swedish filter without disturbing the precipitate, throw on the precipitate with the last portions, and thoroughly wash filter, together with contents, with water until free from acid, as determined by litmus paper. Ignite, contained in a tared porcelain crucible, the metastannic acid, at a strong red heat, whereby it is converted into stannic oxide, SnO_2, containing 78·67 per cent. of tin, and weigh as such.* If the amount of metastannic acid is at all considerable, the final ignition should be formed over the gas blowpipe.

Lead.

The filtrate remaining from the determination of the tin, which contains the remaining metals in solution, is concentrated by evaporation, cooled, and an excess of sulphuric acid added. It is then mixed with two or three times its volume of methylated spirits, and allowed to stand for some hours, until the resulting precipitate of sulphate of lead has settled to the bottom of the containing vessel. When this is accomplished, the supernatant liquid is passed through a Swedish filter, the precipitate thrown on with the last portions, and the filter, with contents, washed with acidulated water—one sulphuric acid to five water—and finally with methylated spirits to remove the acid. (On no account must the alcoholic washings be mixed with the filtrate.) The filter and contents are then ignited in the special manner described, and subsequently weighed. Lead sulphate contains 68·32 per cent. of lead.

Copper.

Make up the solution† remaining after

* The weights of the filter-paper ash must be deducted from the weights of all precipitates.

† If more than one gramme has been taken for

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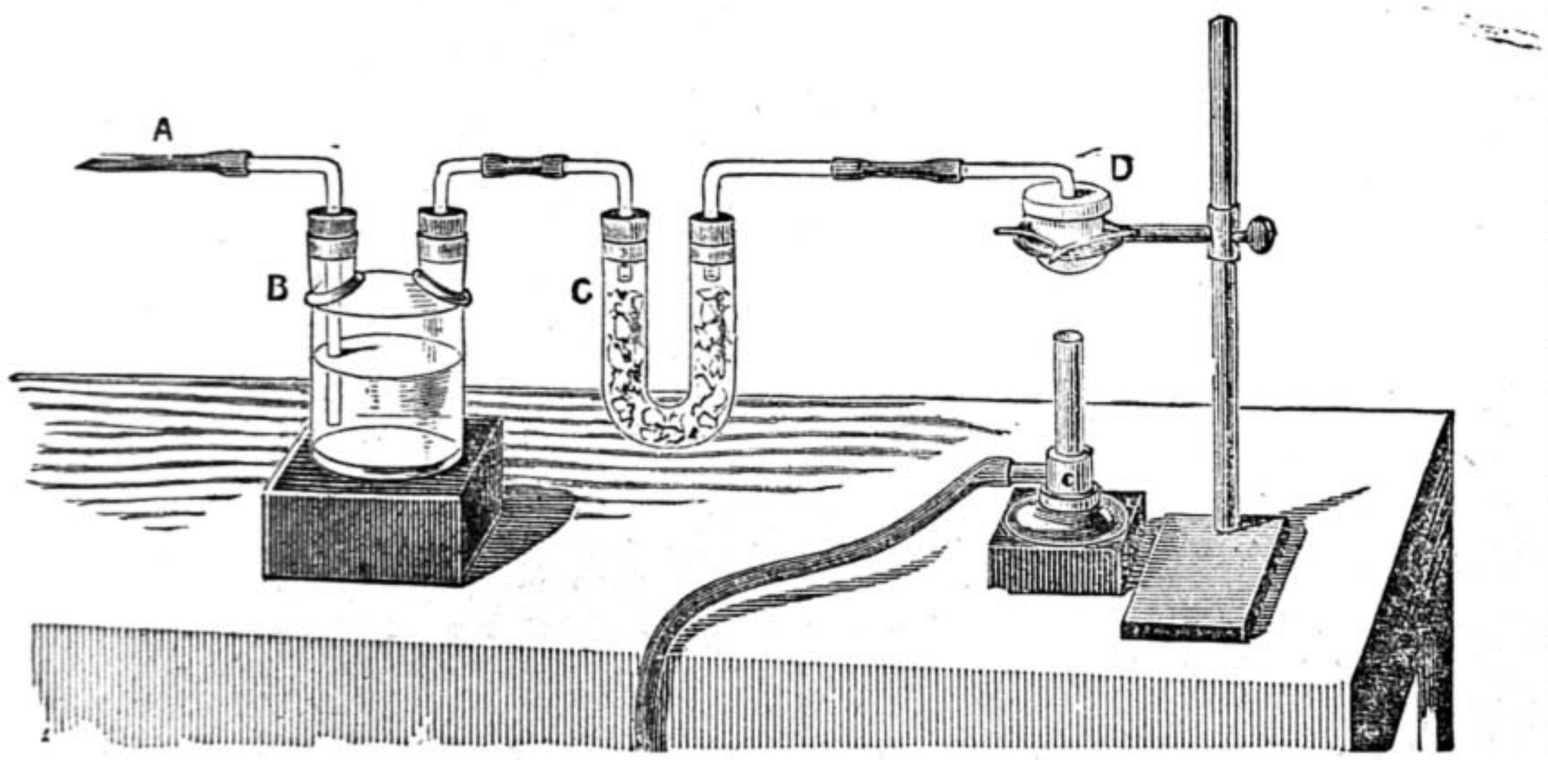
the estimation of the lead to a volume measuring 400 cubic centimetres, and add a small quantity of sulphuric acid. (It is necessary to have a slight excess of acid present, to prevent precipitation of the zinc, as sulphide, along with the copper.) Heat the solution to boiling, and while hot, conduct a current of sulphuretted hydrogen gas through until it is thoroughly saturated, whereby the copper is precipitated as sulphide. Allow to stand for some time, collect the precipitate on a Swedish filter, and wash with water containing sulphuretted hydrogen. On account of the acidity of the solution, the whole of the copper, in all probability, will not, in the first instance, have been precipitated. The filtrate, therefore, remaining after precipitation as above is diluted, cooled, and a current of sulphuretted hydrogen gas again conducted through; the second precipitate collected, washed with the sulphuretted hydrogen water as before, and the two precipitates ignited in the following manner: Having dried the filter-papers and contents, detach, placing in a tared porcelain crucible, the precipitates of copper sulphide as completely as possible from the paper, ignite the latter separately, and add the ash to the contents of the crucible. The copper sulphide precipitate is now intimately mixed with at least twice its weight of pure powdered sulphur, and the mouth of the crucible loosely closed with a lid, through which passes a porcelain or hard glass tube, connected with a hydrogen generating apparatus. Allow the current of hydrogen to pass into the crucible for some time, until it is judged that the precipitate be thoroughly impregnated, when ignite the gas escaping at the mouth of the crucible. After proceeding thus for fifteen to twenty minutes, apply, at the first, a gentle heat to the crucible, and gradually increase to bright redness, at which temperature maintain until the flame burning at the mouth of the crucible ceases to be coloured blue (due to the presence of sulphur). When this point is obtained, remove the source of heat, extinguish the flame at the mouth of the crucible, and allow the latter, together with contents, to cool, the current of hydrogen being allowed to pass over meanwhile. Subsequently, when cold, re-weigh the crucible to determine increase due to the copper sulphide, Cu_2S, which contains 79·85 per cent. of copper.



Apparatus for Ignition of Copper Sulphide Precipitate—A, Connection with Hydrogen Generating Apparatus; B, Wolff's Bottle containing Sulphuric Acid for drying the Gas; C, Tube containing Calcium Chloride for drying the Gas; D, Tared Porcelain Crucible containing the Copper Sulphide Precipitate.

IRON.

The filtrate, or, if the copper has been determined in several portions, the combined filtrates, from the above determination, is heated to boiling for some time, until the volume is considerably reduced, filtered from any free sulphur, and the iron oxidised to the ferric condition by the addition of a small quantity of strong nitric acid, and again heating to boiling. This solution* is then cooled, and after the addition of a small quantity of water containing barium carbonate in suspension, allowed to stand in a warm place for some considerable time. The resulting mixed precipitate of iron and barium carbonates is collected on a filter, washed (the filtrate and washings being preserved for the determination of the zinc), and then dissolved in the least possible quantity of hot hydrochloric acid. The resulting solution is diluted, ammonium chloride added, together with ammonia in slight excess, and heated to boiling. The precipitate is collected on a filter, re-dissolved in hydrochloric acid, and, after dilution of the resulting solution, ammonia in excess added, with heating to boiling. The iron is thus obtained as hydrated ferric oxide, free from barium carbonate. It is collected on a filter, well washed with hot water, converted by ignition, contained in a porcelain or platinum pot, at a strong red heat into ferric oxide, Fe_2O_3, and weighed as such. Ferric oxide contains 70·00 per cent. of iron.

ZINC.

To estimate this constituent to the filtrate remaining from the above determination, after concentrating, is added ammonium chloride, and a current of sulphuretted hydrogen conducted through to complete saturation, the mouth of the containing vessel closed, and allowed to stand in a warm place for some time. The resulting precipitate of zinc sulphide is subsequently collected on a filter, washed with water containing sulphuretted hydrogen, dried, removed from the filter-paper to a tared porcelain crucible, and after the addition of the paper ash, and at least twice its weight of sulphur, ignited in a current of hydrogen gas in a manner similar to the copper sulphide precipitate, and ultimately weighed as zinc sulphide, ZnS, which contains 67·01 per cent. of zinc.

* If it contains much free acid, it must be neutralised by the addition of sodium carbonate.

analysis, it is advisable to divide this solution into two or more equal portions, and after dilution, &c., to precipitate the copper in each in the manner above described.

A MANTELPIECE WITH ITALIAN RENAISSANCE CARVINGS.

BY ALEXANDER MARTIN.

CONSTRUCTION OF MANTEL PROPER—DIMENSIONS—JAMBS—MOULDINGS—FRIEZE—MANTELSHELF.

THE corresponding pilaster should be of a different design, without being *too* much different to that shown in Figs. 2 and 3 (page 317); and this is best obtained by keeping some of the leading forms or lines similar in them both. In Fig. 4 is given three portions which may be used in place of some parts of Figs. 2 and 3. For instance, the top part of Fig. 4 takes the place of the top part of Fig. 3. The connecting scrolls being exactly alike, there need be no fear of an awkward joining. The central portion of Fig. 4 takes the place of a portion of Fig. 3 near its lower end, where the outline is the same but the detail in the centre of pilaster is quite different, and the enclosing leaf is much lighter in mass. The lower portion of Fig. 4 are set in immediately above the scrolls which rest on the vase in Fig. 2. With these three portions incorporated with the first design for pilaster, the two will then be sufficiently like, and yet unlike, one another.

With these pilasters carved, the mantel proper may now be started. The front elevation (in Fig. 1) is drawn to the scale of one inch to the foot, or one-twelfth real size. An end elevation is given, to the same scale, in Fig. 5. An enlarged plan of the jamb is shown in Fig. 6, while a section through the frieze in centre is given in Fig. 7. It is, perhaps, as well to mention here that these sections should be drawn out full size on paper or on a board, so that the exact dimensions of any piece of wood may be had when required. This, though occupying time at first, saves much time and temper in the end. In drawing out the job full size, the first thing to settle is the size of the opening for the grate. If possible, get the size of the actual grate that will be put in; but if, as is not uncommon, that cannot be determined, the next best plan is to make the opening of the mantel of such a size that will most likely suit the grate when it is placed in position. A usual opening to work to in such a case is that taken in this instance, viz., 3 ft. 4 in. wide, and 3 ft. 2 in. high. The moulding round the opening is fastened separately, so that it may be fixed to suit the grate, half an inch either further in or further out. The mantelshelf should stand about 4 ft. 3 in. from the floor; higher than this it is not advisable that it should be, and though it may be two inches lower, that is about the extent it may vary with safety.

Supposing the height mentioned (4 ft. 3 in.) be that decided upon, the jambs are formed with a frame as in Fig. 8, which will measure 4 ft. 2 in. long, reaching from the floor to under side of shelf. Each style or upright is 2½ in. broad by 1 in. thick, and the finished breadth of the frame is ten inches. These styles are of walnut, but the three rails will be quite covered up, so they may be of deal, 4 in. broad and 1 in. thick. Against this frame is placed the carved pilaster, which will be found to overlap the edges of the styles by half an inch, leaving 1¼ in. of their surface seen. The pilaster is screwed fast from behind, through the three pine rails, and is blocked up the sides of the styles as well. (See Fig. 6.) On the outer side of each jamb is now placed a piece of wood, the whole length, by 3 in. wide

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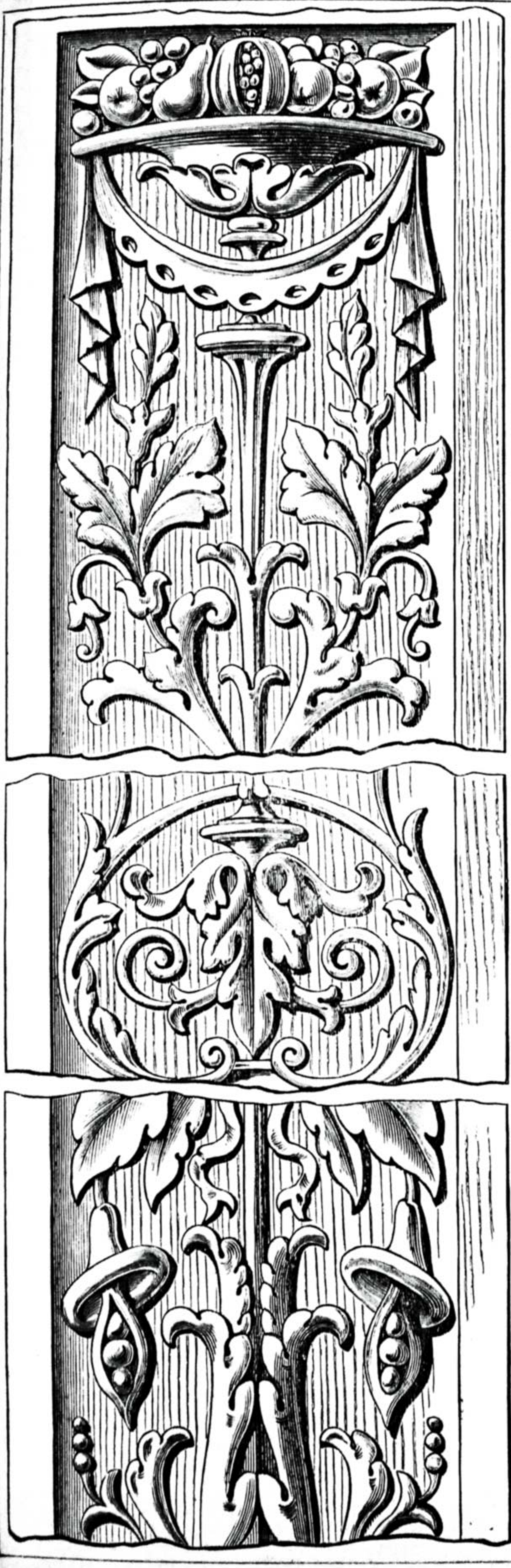

Fig. 7.—Section through Frieze.

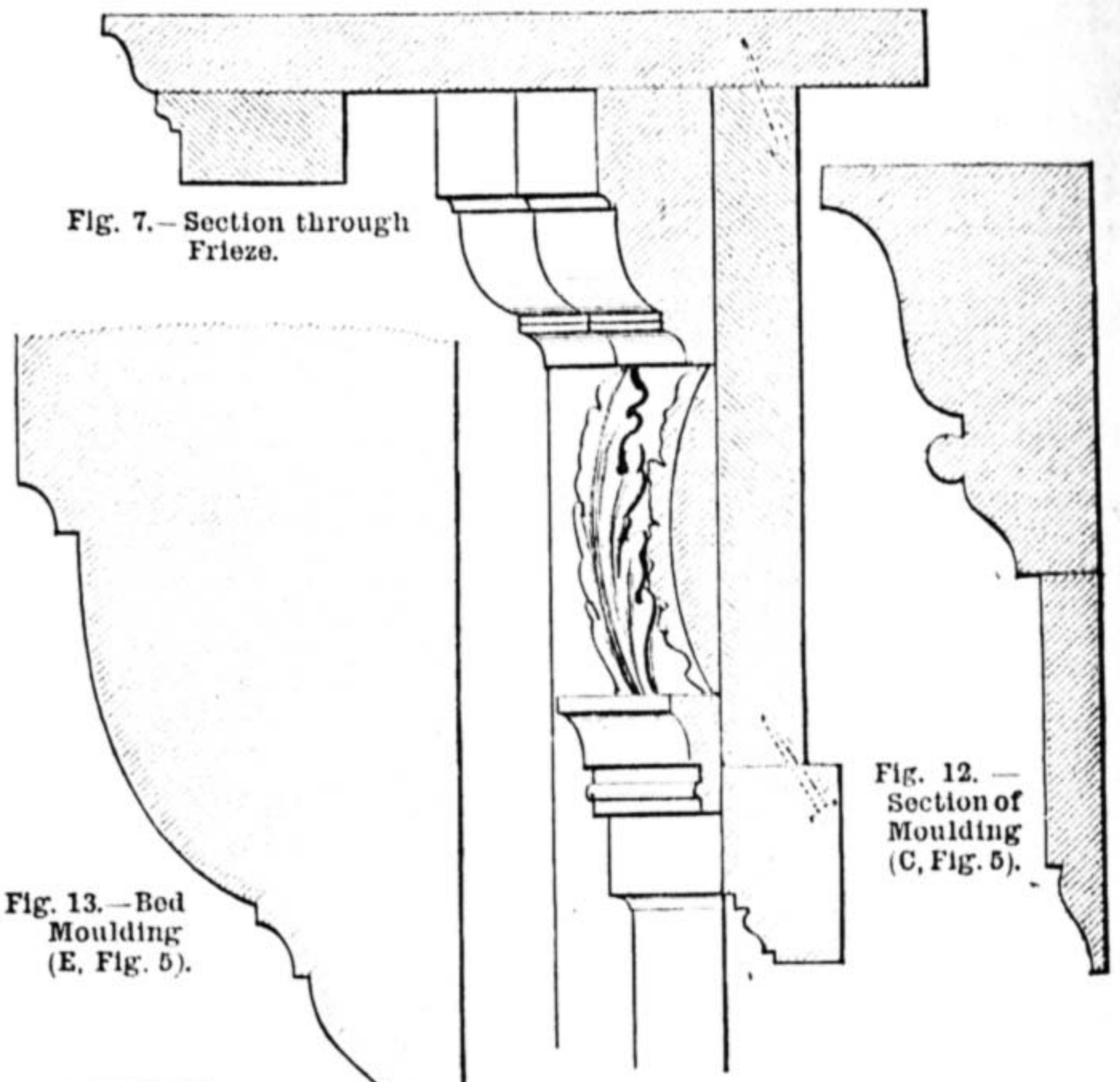

Fig. 13.—Bed Moulding (E, Fig. 5).

Fig. 12.—Section of Moulding (C, Fig. 5).

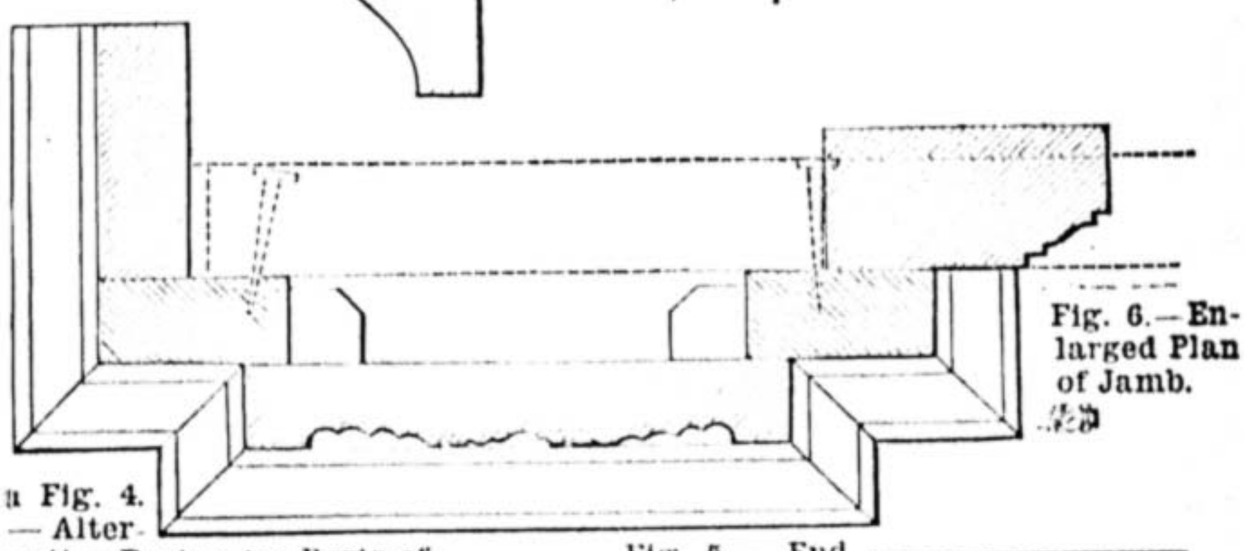

Fig. 6.—Enlarged Plan of Jamb.

Fig. 4.—Alternative Design for Parts of Figs. 2 and 3.

Fig. 5. End Elevation.

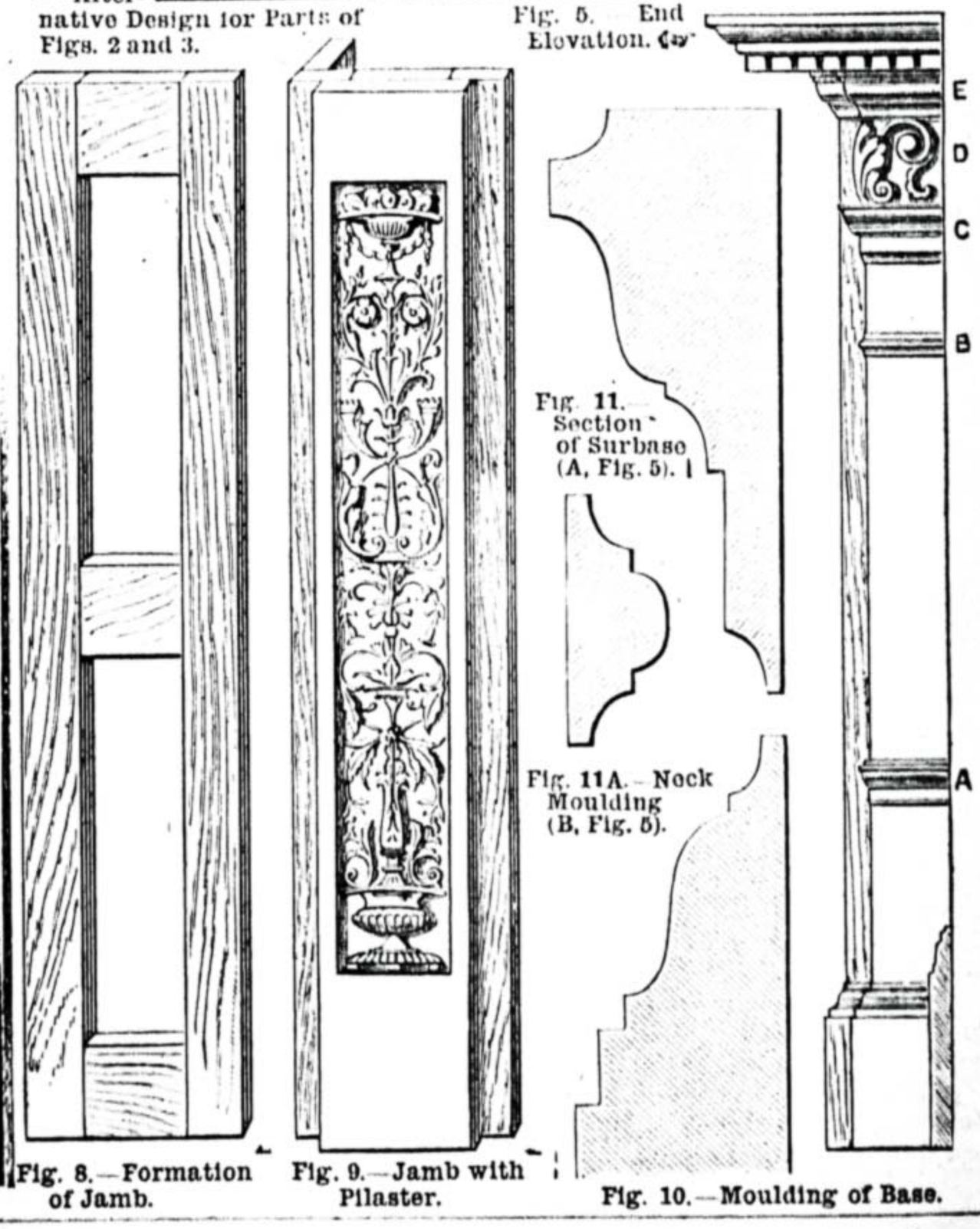

Fig. 11.—Section of Surbase (A, Fig. 5).

Fig. 11A.—Nock Moulding (B, Fig. 5).

Fig. 8.—Formation of Jamb.

Fig. 9.—Jamb with Pilaster.

Fig. 10.—Moulding of Base.

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and 1 in. thick. This is glued and blocked fast, and the jamb now looks as sketched in Fig. 9—ready for the base and other mouldings and carvings being planted in their positions, and ready also for the deal rail behind carved frieze, which connects the two jambs together. The base is 7 in. high to top edge of moulding, and is ⅞-in. thick, moulded as in Fig. 10 (drawn full size), and is mitred round pilaster and jamb, butting against the wall at the one side, and the moulding (to be afterwards fixed) round grate. It will be noticed that the piece on front of carved pilaster is carved; therefore, after fitting the base round, get this piece carved before gluing fast. The detail of this carving will afterwards be given. The next moulding is the surbase marked A. (See Fig. 5). This is given in full-sized section in Fig. 11. It is mitred round the jamb, stopping square (or "butting," as it is called) against the wall at one side and the grate moulding at other side, exactly as the base did; but it also butts against the side of pilaster, instead of mitring round it like the base. (See Fig. 1.) The pilaster is 1 in. thick, and as this moulding has less than that of projection, it will stop nicely against its edge. Passing upwards, the neck moulding (B, Fig. 5) is fitted exactly as A was; it is given full size in section in Fig. 11A. The next moulding, C, shown full size in section in Fig. 12, is fitted in its position in the same way. After marking the position of mouldings B and C, the little flutes (shown in Fig. 1) should be worked, after which the mouldings may be made fast—excepting the inner parts of C. These inner parts of C must be mitred to the moulding carried along the frieze, and as the other mouldings above this are also mitred along frieze, the deal rail before mentioned should now be fastened in position. This rail is entirely covered with carving and mouldings planted on its face; hence it need not be of walnut. It measures 9½ in. by 1 in. thick, and is long enough to extend behind the framing of jamb, so that it may be screwed to both styles of framing. (See dotted lines in Fig. 6.) If any blocking connecting the outer gable with this frame is in the way of this rail, it should be removed where the rail interferes; it may, of course, be put in again on the top of the rail. A rough spar, about 3 in. by 1 in., should be fastened at bottom of jambs in the same way as this top rail is, to keep everything square until the job is finished. As, of course, this is merely a temporary contrivance, it should only be screwed, so that it may be readily removed when the mantel is being fixed up in its place. It will also have to come off before that; but of that more anon.

The bed-moulding, E (Fig. 5), is next mitred round all the breaks of pilaster and along the frieze; a section of the members of this moulding is given full size in Fig. 13. This moulding is 4½ in. wide, and the members shown are worked on its lower side. The portion of moulding on front of carved pilaster is carved also, the detail of which will afterwards be given. After being fitted, and before being fastened, this carving should be done, as it will be more easily handled than when fastened in its place.

The moulding C (Fig. 5) was left unfastened to allow of its being mitred along the frieze. This is only partly carried along the frieze (the upper part of Fig. 12); the lower part stops against the grate-moulding yet to be put on. In Fig. 7 this is clearly indicated, where also is shown the moulding projecting below the bottom edge of the deal frieze-rail. When this moulding is properly fitted and fixed, the convex frieze (D, Fig. 5) is prepared. It is of wood 1 in. thick, and of sufficient breadth to fit accurately between mouldings C and E. It is convex, as shown in Fig. 7; but as in such Fig. it is shown in section, as if carved, it may be well to state that, when preparing it for the carver, it should be of section as in Fig. 14, which, to save space, is drawn only half full size. The thickest portion is the full inch, and the edges are only ⅝ in. thick. The dotted line in Fig. 14 shows where the ground of the carved work will be.

In fitting this frieze, the centre piece should butt right between the framing of jambs. This part of the frieze must then be carved—or, at least, have the ground set down at each end before the adjoining parts of frieze can be fitted; for they are "scribed"

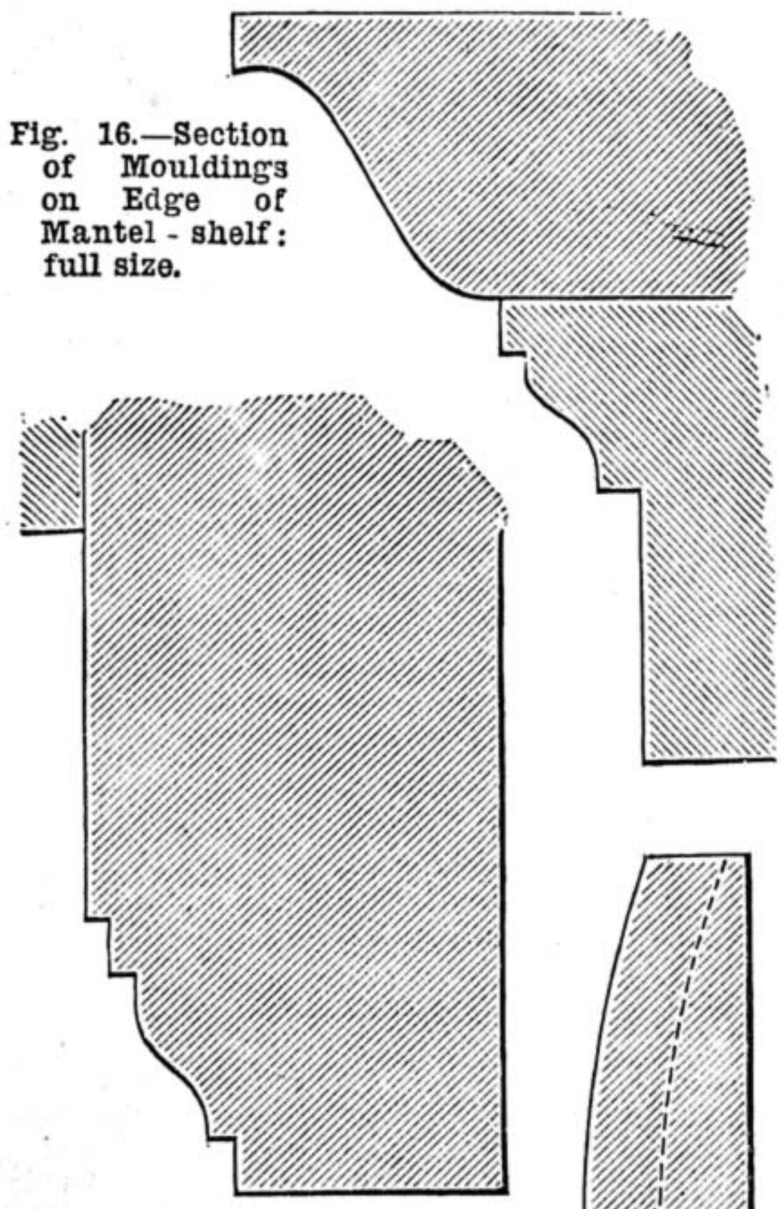

Fig. 16.—Section of Mouldings on Edge of Mantel-shelf: full size.

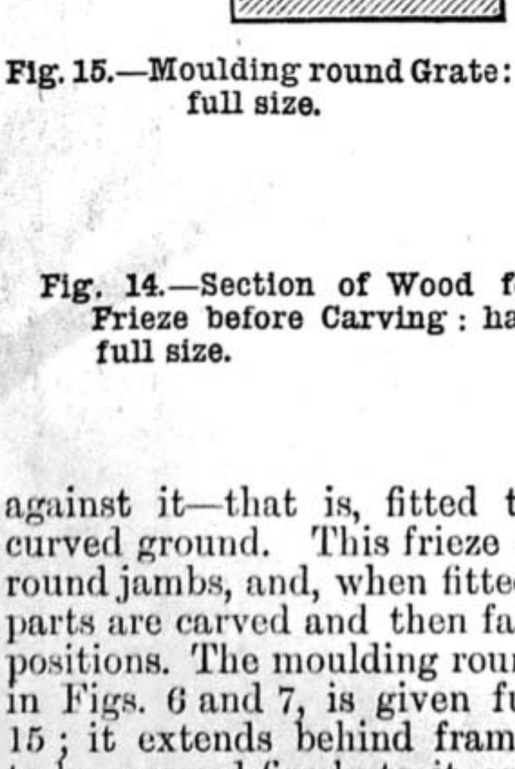

Fig. 15.—Moulding round Grate: full size.

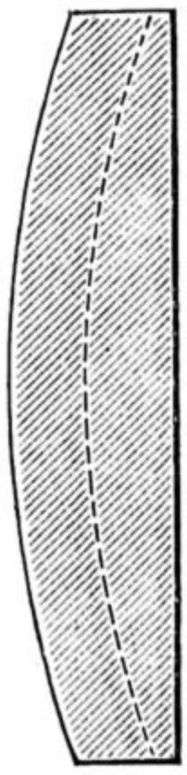

Fig. 14.—Section of Wood for Frieze before Carving: half full size.

against it—that is, fitted to butt on its curved ground. This frieze is then mitred round jambs, and, when fitted, the different parts are carved and then fastened in their positions. The moulding round grate, shown in Figs. 6 and 7, is given full size in Fig. 15; it extends behind framing sufficiently to be screwed firmly to it, and it is pocket-holed, to be screwed to frieze-rail (see Fig. 7). In order to get this moulding put on, the temporary rail at foot must be removed, and afterwards fastened on behind this grate-moulding, until the mantel is fitted up in its place. This prevents any unnecessary strain being put upon the fastenings of the frieze-rail while the mantel is being handled—in polishing, etc.

The mantelshelf is the only thing required to complete the cabinet-making part of the job. The shelf itself is 11 in. broad and 1 in. thick, and has a clamped moulding 2½ in. by 1⅜ in. along its front and ends. A full-sized section of mouldings on edge is given in Fig. 16, the dividing line showing the joint of the clamp. The ogee may be worked on the end wood at end of shelf, but the clamp-piece should be mitred for the sake of the carved dentils. The shelf is secured by half a dozen screws from underneath. (See Fig. 6).

OUR GUIDE TO GOOD THINGS.

*** *Patentees, manufacturers, and dealers generally are requested to send prospectuses, bills, etc., of their specialities in tools, machinery, and workshop appliances to the Editor of* WORK *for notice in "Our Guide to Good Things." It is desirable that specimens should be sent for examination and testing in all cases when this can be done without inconvenience. Specimens thus received will be returned at the earliest opportunity. It must be understood that everything which is noticed, is noticed on its merits only, and that, as it is in the power of any one who has a useful article for sale to obtain mention of it in this department of* WORK *without charge, the notices given partake in no way of the nature of advertisements.*

60.—MACPHERSON'S FOOCHOW ENAMEL.

Ever since the appearance of Aspinall's Enamel, which is reputed to have set certain enthusiastic home decorators among women "aspinalling all the day," many proprietors of paint and colour-works have been striving to the very utmost to produce something, that if it did not altogether rob Mr. Aspinall of his laurels, should, at all events, prove a competitor for public favour which should run his speciality hard, and render it a difficult matter for him to hold his own and still to keep ahead. The most successful in the competition appear to have been Messrs. Donald Macpherson & Co., of London, Manchester, and Brussels, Oil, Paint, Colour, and Varnish Manufacturers and White Lead Grinders, who have brought into the market a fluid colouring substance, apparently half paint and half varnish, which has the merit of drying very rapidly, as I can testify by experiment, hardening sufficiently in five minutes to prevent anything that touches it from being soiled by the contact, as would be the case with ordinary wet paint; and this rapidity of drying and hardening, apart from its other merits, renders this "Foochow Enamel," as it is called, a most desirable decorative medium for household use. The tints are numerous, there being no less than seventy-eight on the list of tints and sixty on the show-card sent out with specimens of the colours. "It can be used on any dry surface," to use the words of the manufacturers, "on any dry surface, greasy or otherwise, whether it be metal, wood, plaster, rubber, leather, paper, or *papier mâché*, producing a surface as smooth and as glassy as a mirror. Wainscots and cornices can be made in a few minutes to resemble mahogany, and floors to look like old oak, its rapid drying properties rendering it invaluable in this respect, as floors treated with it in the afternoon can be walked on at night without injury to the enamel." For fancy decorative work it is unique, for the plain tints may be combined with gold, silver, fire, green bronze and red bronze, colours which impart lustrous metallic effects of great beauty, contrasting pleasingly with the ordinary tints. The metallic colours are made up in bottles at 6d. and 1s., sent post free for 9d. and 1s. 3d. The ordinary colours are sent out in tins with cover that can be easily removed and replaced. The enamel must not be brushed into the material like ordinary oil colour, but must be *floated on* with a full brush and left to smooth itself, when it will dry quickly with a hard and lustrous surface. When used as a floor stain one coat is sufficient, but for painted work two or three coats are necessary, each being allowed to dry before the next coat is put on. If it is desired that the enamel should dry with an egg-shell gloss, a small quantity of any kind of oil may be added; but to produce a dead flat tint, a little methylated spirit should be used instead of oil. There is no offensive smell with the enamel, so the most delicate may use it.

THE EDITOR.

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SHOP:

A CORNER FOR THOSE WHO WANT TO TALK IT.

NOTICE TO CORRESPONDENTS.

*** *In consequence of the great pressure upon the "Shop" columns of* WORK, *contributors are requested to be brief and concise in all future questions and replies.*

In answering any of the "Questions submitted to Correspondents," or in referring to anything that has appeared in "Shop," writers are requested to refer to the number and page of number of WORK *in which the subject under consideration appeared, and to give the heading of the paragraph to which reference is made, and the initials and place of residence, or the nom-de-plume, of the writer by whom the question has been asked or to whom a reply has been already given. Answers cannot be given to questions which do not bear on subjects that fairly come within the scope of the Magazine.*

I.—LETTERS FROM CORRESPONDENTS.

Mitre Cramp.—H. B. writes, in reply to CODGETO, see page 275, Vol. I.:—"Sorry to have unknowingly copied Kildonan's principle of mitre cramp, not having seen it until you drew my attention. The block, A, must be a right-angle bisected by the saw-cut E^1 E. The size is unimportant. Mine is 8 in. from E^1 to G, and 5½ in. from E_1 to E. The sketches on page 111 are not drawn to scale but in the perspective view."

Mandrel for Lathes.—A. W. (*Cromarty*) writes:—"At page 159, J. T. refers to the cost of mandrels by Britannia Company, Colchester, a company who make excellent work and charge very high prices. Let him try H. B. Massey, Spalding, where he will get as good work at a very different figure."

II.—QUESTIONS ANSWERED BY EDITOR AND STAFF.

Attendance on Dynamos.—J. S. (*Newcastle*).—The general attention required is similar to that needed by all high speed machines. Keep all bearings and wearing parts clean and properly oiled. See to it that the driving belt is wide enough to take a good grip on the pulley, and thus maintain a good speed without undue tightness. Near one end of the armature spindle you will find a boss of brass in two or more segments, on which press lightly two strips of brass or of copper. This boss is named a commutator, and the strips pressing on it are named the brushes. These are the wearing parts of the machine. The brushes must be adjusted to the proper angle, and this is found by practice to be in that position when there is a good flow of current from the machine and very little sparking under the brushes. Sparking wears away brushes and commutator very fast. The wear of the brushes will demand frequent adjustment to keep them bearing on the best part of the commutator. When the brushes cut grooves in the commutator, it is necessary to true this part up, and sometimes put in a new one. You will learn something about the care of dynamos in Mr. Bottone's book, "The Dynamo: How Made and Used," and Mr. Croft's book on "How to Make a Dynamo."—G. E. B.

Marquetry Machine.—W. H. W. (*Leyton*).—There is no machine specially known as a "marquetry cutter," but probably you refer to some fret cutting machine for which its maker claims features rendering it useful for marquetry. I may, however, tell you that the finest marquetry work is done by hand: *i.e.*, with a frame very like that used for ordinary fretwork, but much lighter. The veneers, while being cut, are held in the jaws of a combined seat and vice, called a "donkey." If you wish to try a machine for cutting marquetry you cannot do better than try the Britannia Co's. No. 8 fret saw.—D. A.

Mattress and Bedding Books.—R. B. B. (*Edinburgh*).—There is no book specially devoted to this subject, which even in ephemeral literature has been strangely neglected.—D. D.

Bookcase.—CONSTANT READER.—An illustrated article describing the construction of such a piece of furniture as you describe appears in this number of WORK—D. D.

Clock Materials.—For these go to Mr. Barton, watch material dealer, etc., 31, Williamson Street, Liverpool.—J. S.

Glass Blowing Apparatus.—W. W. (*Whitehaven*).—You will find Messrs. Townson & Mercer, of 89, Bishopsgate Street Within, E.C., one of the best firms you can write to for what you want; you will get a complete set, and they are extremely courteous, and willing to give every information; I can strongly recommend them. If any reader is in want of any chemical or scientific apparatus, they cannot do better than consult the above firm; their catalogue is one of the most complete I have ever seen; it is a handsome book, bound in red cloth, fit for any library, and extends to 400 pp., and nearly 3,000 articles are priced, besides complete sets of apparatus; price of catalogue, 3s.—W. E. D., JUN.

Fret Dealer.—W. H. (*Bury*).—I do not know of any one who makes a speciality of this class of work in Manchester, but many tool dealers supply all that is necessary in the way of designs, saws, etc. You cannot do better than get Skinner's or Harger's Catalogue.—D. A.

Polishing Lenses.—BETA.—I am sorry to disappoint you, but you must give me more particulars. You should think of the Editor as if he were a doctor when you write for his advice. Tell him everything, and then, if he can get help for you he will do so. What lenses are you making? What size and focal length? What are they for? What glass are you using? Are the "wavy lines" in the polish or in the field of view? What are you using to polish the glass? This is the kind of information that you or any other optical querist should give. Without it—well, the very information I might send to the printer would be useless to you.—E. A. F.

Acid on Gold.—JEWELLER.—The stuff you are asking about is boracic acid. It can be bought at most chemists and druggists in twopennyworths. It is a powder which you mix with water to a cream-like consistency, and apply with a camel-hair pencil just as you apply your borax for soldering. This is the way I use it: first borax the work, apply the pallions of solder and dry it; then, in the second place, paint the acid all over the work, and run the solder in run. My reason for this is to keep the borax perfectly free from any and every material which could by any chance prevent the solder flushing. Then in all such jobs it is best, I think, to endeavour to do them at one heating, and to let them get quite cold afterwards, before cleaning in sulphuric acid pickle.—H. S. G.

Bookcase and Cupboard.—CONSTANT READER.—A bookcase is given with this number that will, I think, meet your requirements. If the dimensions are not precisely in accord with your own, you will find no difficulty in modifying the size to suit your own wants.

Safety Bicycle.—J. W. H. S. S. (*Sheffield*).—Instructions to make a safety bicycle could not be given in a "Shop" reply. I think a former correspondent made a similar request, when I signified my readiness to contribute a series of papers on the subject, and I still await the Editor's time and opportunity to make use of such a series.—A. S. P.

Voixophone.—T. N. (*Halifax*).—The only "musical instrument" (if it can be dignified by that term) with which I am acquainted answering to the above name is one of the "Za Zah" or "Kazoo" tribe, and which you can make by procuring a piece of stout bamboo reed about 1 in. in diameter, and about 10 or 12 in. long. At a distance of 1½ in. from each end on opposite side of this tube make a hole of ½ in. in diameter, and then with gold-beaters' skin cover each end by tying, not gluing, it on, and the instrument (of torture) is complete. To play it, cover one of the holes with the lips and sing (or howl) into it, and the musical sounds emanating from it will bear a strong resemblance to those produced by the time-honoured paper and comb. If this is not the kind of instrument you mean, please explain more fully, and I will try my best to help you.—R. F.

Musical Box Comb.—J. O. (*Huddersfield*).—You will be able to obtain a new comb for your musical box by sending to Messrs. Paillard & Co., 62, Holborn Viaduct, London. It will be necessary to send the whole box, as they will require it for fitting. Send it carriage paid, and ask for an estimate of the cost, as it may be more than you are inclined to pay. From the size you give, it will cost not far short of a couple of pounds, and I have found that as a rule these sort of jobs do not recompense one for the outlay. If you send the box, see that the spring is quite down, and, at the same time, that the click or trigger which stops the movement at the end of the tune is in position in its slot. Cut a wedge of cork, and fix it tightly between the face of the drum containing the spring and the left end of the barrel. This will prevent any shifting of the barrel and consequent damage to pins, etc. If you decide upon having a new comb, it will probably take six or eight weeks to get it done, as the work will have to be sent to Switzerland. You may, however, depend upon its being thoroughly well done.—R. F.

Pocket Lamp.—J. H. (*Manchester*).—If you or others have a pocket lamp that you think would suit W. G. H. (*St. Germans*), you should advertise it in the cheap "Sale and Exchange" column of WORK, which space has been specially allotted for advertisements of the kind.

German Silver Cuttings.—A. L.—This answer is bound to be unsatisfactory, no information being given as to quantity, nor yet the place where it is desired to dispose of it. Such "scrap" as this is usually returned to the dealer that sold it. He generally allows a good price, for he knows the quality, of which there are several. If that is not possible, then you should take or send a sample to some respectable firm, and ask them for an offer for it. Do not omit to give the weight as near as you can of the "quantity" you possess. If you do not know of any such dealer, you will find the addresses of jewellers' material shops and of dealers in metal by dozens in the Directory. Send one or two of them a reply post-card, asking if they are open to buy your "quantity." This is the best I can do for you with so little information to go upon.—H. S. G.

Draughtsmanship.—T. D. G. (*Highgate*).—I suppose from your letter that you mean that you have to make plans of existing buildings in which it is intended to put machinery; that you find a difficulty, and that you ask how to set about it. You should commence by rudimentary geometrical drawing, which you can learn from any school-book on the subject (which you may easily pick up for sixpence or less, on any secondhand bookstall). When you can draw any angle, any proportion of parallelogram, right or oblique, either full size or to scale, careful measurement only is necessary. Thus take for instance a room (inside dimensions); measure one side, commencing always with the side in which the principal door is. Draw a line roughly in your note book and mark in feet and inches its exact length, A B, thus—

A [door] 19 ft. 6 in. B

| 3 in. × 2 ft. 9 in. 25 ft. 3 in. |

then the distance from corner A to door opening, then the opening of door, then the distance to B from door on that side, then, as a check, add 3 ft., 2ft. 9 in., 19 ft. 6 in. together, which must be the full length, 25 ft. 3 in.; if you have made any mistake you will thus find it out. Now proceed with the other walls in the same way, drawing lines to indicate their position. Never mind the exact proportions in your sketch, the figures are the main point, the sketch only shows to which wall the figures belong. When you have gone all round giving all window and door openings, all projections, chimney breasts, etc., check the squareness of the room by measuring carefully both diagonals, *i.e.*, from opposite corners, both ways, marking them on your sketch in feet and inches, and even an odd quarter of an inch. Do the other rooms in the same manner, taking care to get their relative positions from the same party wall, and ascertain that it is straight, marking the thickness of each wall (which you can easily get at) the door and window openings). It is usual to mark heights on plan with a circle round them. If any beams run across to support floors above, show them in your note book in dotted lines, and put their dimensions and distances apart (and also from the party wall from which you are measuring) in blue pencil or red pencil, as also skylights, ventilators, or other interruptions that occur in ceiling. This being done, if you cannot yourself make a correct plan, anyone else who can draw plans can construct them from your measurements without having to go and take them. Meantime, by all means, if you have the leisure, attend any technical drawing classes, such as the one you mention, or those of the Polytechnic. If you explain exactly what you want to become proficient in, you will readily ascertain what course to take.—J. W. H.

Jet Black Ink.—A CONSTANT READER, P. B. L. (*Padiham*), does not say whether for writing or printing, or for window tickets. My guess may be wrong, if so, please write again; meanwhile, if you want to make ordinary writing ink dry black and glossy you have only to add lump sugar finely powdered until (experiment alone can decide) the sugar, being dissolved, produces the effect. Gum arabic crushed with the sugar in a mortar enhances the effect, and will not crack if you use enough sugar to prevent it. It would be of no use my giving a formula, inasmuch as it must vary according to the make of the writing ink. Red, violet, green, and other writing inks are rendered very bright and glossy in the same way. Use a hard sized smooth paper or Bristol board that will not soak up the ink. Printing inks are thrown up glossy by adding japan gold size and best copal varnish, in equal proportions, to the ink; but the copies should be laid out for an hour, not super-imposed or they are apt to stick together.—J. W. H.

Gold Printing Composition.—E. C. M. (*Ipswich*).—1. I never heard of such a composition. Gold (*i.e.*, real gold) printing is done by printing with hot brass blocks on sized paper, silk, satin, etc., with leaves of gold leaf between, when the pressure is put on. Imitation gold leaf (Dutch metal) may also be used in the same way. What the public often take for gold printing (from stone, or wood, or type) is done with bronze powder, which is made in all shades from deep copper colour, to rich gold, pale gold, green gold, even to silver white, which is dusted on to the paper immediately after the sheet is printed in an ink composed of japan gold size, mixed with a pigment, yellows and even reds being used under the bronze according to the desired shade, or richness of colour. Steel blue, emerald green, and other similar unprintable dust colours are used in this manner, and when the gold size is dry the colour is permanently fixed. 2. In a similar manner, by adding a very little japan gold size to the ordinary black ink in which letter headings are printed (either litho or letterpress), and dusting them over with a mixture of equal parts of powdered gallic acid and proto-sulphate of iron. Such printed heading will copy in the usual way in the press on the damped leaf of the ordinary copying book.—J. W. H.

Inks for Block Printing on Calico.—H. G. (*Liverpool*) asks us a number of almost breathless queries. 1. For a list of tools for soleing and heeling boots, and where to get them, and whether in "Shop" any instruction will be given. In WORK, Nos. 39 and 44, page 622 and page 702, if H. G. had perused them, he would have seen the subject treated of by H. G. (*Bishopsgate*) and NITRAM in reply to J. R. He can get the tools from any Liverpool curriers, and they will tell him what he requires. 2. Best inks to use for printing on calico: Calico printing is one of the most intricate and complicated processes ever brought to perfection. Block printing has long been superseded by machine printing from engraved copper rollers, and the colours used consist of chemical combinations afterwards re-acted upon by dyes and other re-agents which convert each printing into far different

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colours to the dull greys originally laid on, which are fast, that is, will resist frequent washing. In the old block printing on calico, which was done by hand, the blocks were always inked precisely as indiarubber stamps are now inked on a pad; but, as previously stated, in inks bearing not the slightest resemblance to the intention of the design, being afterwards chemically changed to fast and brilliant colours. If H. S. applied by letter for a visiting order to Hoyle's Print Works, Mayfield, Manchester, he might (possibly) see two or three very old men, the last of the race of calico block printers, at work, and their chemist (who, in common with the chemists employed by all large calico printers, receive salaries varying from £800 to £1,500 per annum) might possibly give him a wrinkle or two. I can, however, tell him this much, that printing on calico is to be considered rather as dyeing than printing. Size is of no use at all. Calico before printing is subjected to some mordant such as alum (double sulphate of alumina and potash), which fixes the dye or pigment afterwards used. 3. How to set to work painting magic lantern slides: First, can H. G. draw and paint? if not, do not attempt it; if he can make designs in water-colour on paper, make careful tracings, and then, pricking through these designs with a needle, pounce with venetian red on to the glass (which has previously been coated with a very thin coat of venice turpentine just as it is "tucky"). As soon as the surface is dry, paint, exactly like the water-colour designs, your subject (using oil colours in tubes) with the transparent colours only. By lifting the glass and looking through it you can see its effect as you proceed, or better still, fix it against an upper window and paint against the light. Again, you can make a transparent positive, photographically from a negative, varnish it with spirit varnish, and add the colouring by hand. I have, this time, endeavoured to answer all your queries, "not vaguely;" but another time I trust you will observe our rule that each query should be written on a separate slip of paper, so that it may be referred to our experts in each range of subject.—J. W. H.

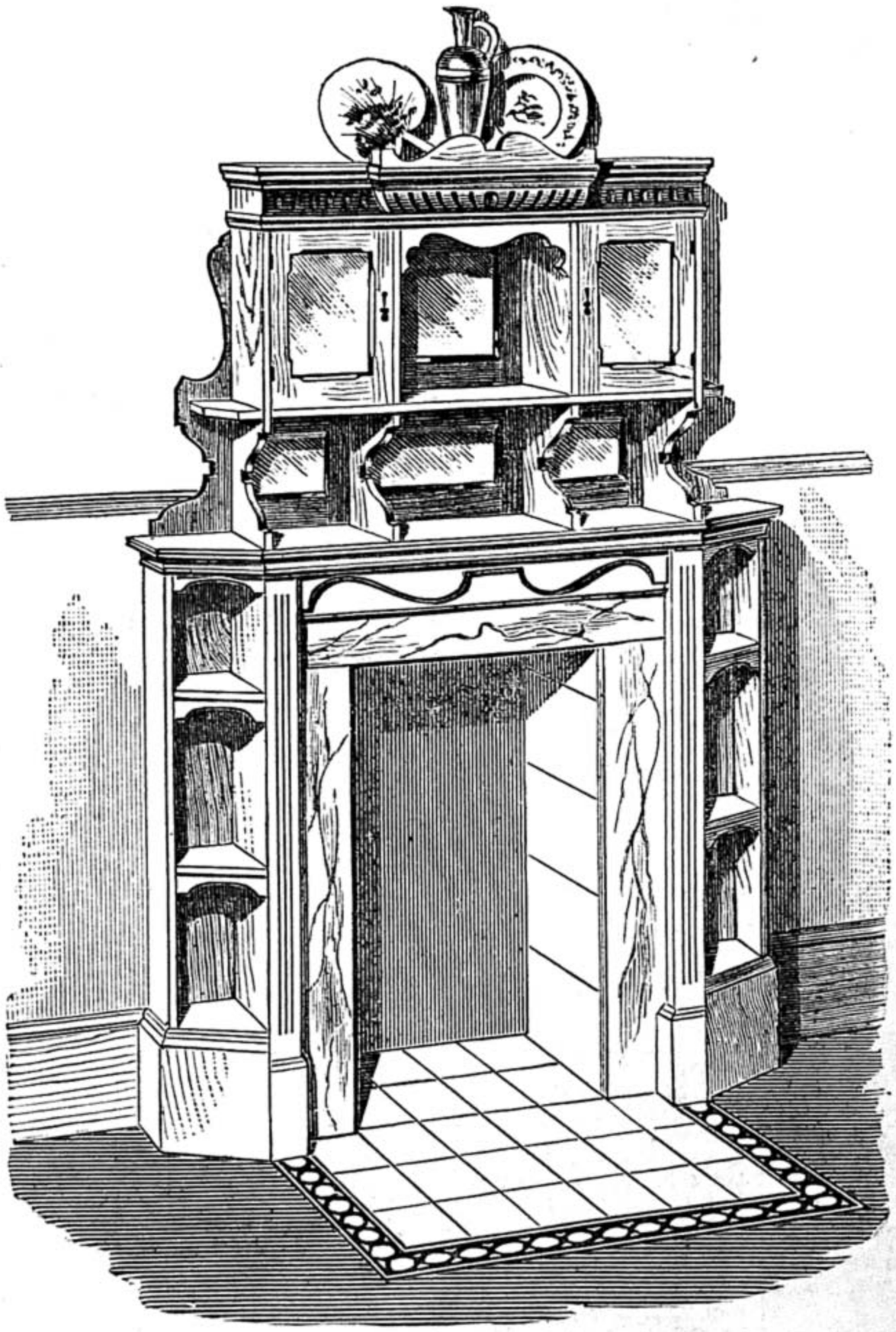
Civil Service Draughtsmen.—LLEWELLYN.—All competitive appointments to the Civil Service of Her Majesty are conferred wholly and solely on those candidates who pass a rigid examination in the various subjects required by the Home Office. Space precludes my giving a list of these, especially as LLEWELLYN does not state with any precision what class of draughtsman he wishes to become—mechanical, engineering, surveying, architectural, or geographical. Write direct for forms and particulars to the Home Office, Whitehall, S.W.—J. W. H.

Concreting Yard.—T. F. F. (*Bowes Park*).—The best materials for concreting floors are crushed bricks, limestone, granite, slag from iron furnaces, or similar hard material. If you use gravel, after it has been down some time, the upper surface becomes rough; owing to the pebbles being round and smooth, the cement does not adhere well to it; if you could crush it and make the pebbles sharp and angular, you might use it. The foundation should be rammed solid and covered with a layer of not less than 3 in. thick of broken stones, to pass through a 2 in. ring, the top of which should be 2 in. below the finished surface. The yard should be divided by strips of wood laid on edge, into spaces about 6 ft. square; if laid in larger sizes than this it is almost sure to crack, and if the foundation is not prepared as above it will most likely crack. To lay the concrete, prepare a hard level piece of ground, or lay a floor of boards on which to mix it; also have a box without top or bottom; fill this three or four times with the crushed material, and once with cements; mix the whole together thoroughly with pick and shovel, then wet it, and turn over twice till all is thoroughly mixed; it must not be made too wet; then lay in each alternate space, and beat it well with a beater till level with the strips, and when stiff, which will be in about twenty-four hours, rub off smooth with a plasterer's trowel, then take up the strips of wood and lay the remaining squares, and finish in the same manner; either three or four to one of cement may be used, but the latter takes longer in setting; it should be laid with a fall to a trap to carry off the water; a channel can be formed in it if required by pressing a piece of round wood into the concrete while soft, and smoothing off with a trowel.—J. T.

Civil Engineering.—T. B. (*Swanley*).—You cannot learn civil engineering by studying at home; but, in addition to other things, diligent home study is necessary that you may get a thorough knowledge of the principles upon which practice rests. To lay the foundation you should go for about three years into the workshops of some busy firm, there to learn the use of tools and become acquainted with the nature of materials. You should next be articled to a civil engineer having actual works in progress, to acquire knowledge as to the designing and execution of work. During this time you should study in the evenings to advance your theoretical knowledge *pari passu* with your practical progress. You should then try and get employment for two or three years with a contractor to get hold of the "dodges" of the trade. What you can earn will depend upon your ability and perseverance in a great measure, but chiefly upon what capital or influence you can command.—F. C.

Pinion and Rack.—R. G. R. (*Blair Athole*).—You can get small pinions and racks at Grimshaw & Baxter's, 33, and 35, Goswell Road, London, E.C.—F. C.

Mantel.—W. W. (*Glasgow*).—You have omitted to state the size of the gas stove you propose using, and whether the flue pipe comes out at the back, side, or top, or where you intend to carry it. I have inserted a sketch of a fancy mantel as desired, which could be easily adapted to suit any form of



Fancy Mantelpiece.

stove. If the general design pleases you, I will give you a few hints as to making same on receipt of further particulars or alterations that you may deem necessary.—E. D.

Hardening Tools.—MACHINIST.—For your purpose make the tool red hot and quench the edge in salt water, then quickly brighten and let the heat descend to the edge until it shows a straw yellow colour, then quench the whole in the salt water. If the tools are not large enough to hold sufficient heat for the tempering (lowering the temper, as it is called) quench them completely and then lay on a piece of red hot iron till the required colour comes. The lighter the colour the harder will be the tool, so if your edge turns you must re-harden and lower to a lighter yellow; but should the edge gap you must re-harden and lower to a deeper yellow. By trial you will soon find the right colour for the kind of material you are working.—F. C.

Bee Hives.—E. H. (*Bath*).—Those who wish to profit by my papers on "Hives" etc., should understand a good deal about the practical part of bee keeping as opposed to appliance making. I will touch on the theoretical part of our craft as little as possible, and simply confine myself to the mechanical. An excellent book for beginners is "British Bee Keepers' Guide Book," by T. W. Cowan, published by Houlston & Sons, Paternoster Square, London, at 1s. 6d. A somewhat more pretentious book is written by Frank Cheshire, and published by Gill, 170, Strand, in two parts, the scientific and practical, at 7s. 6d. and 8s. 6d. each respectively. If a person wishes to be economical, he might send 2d. to Mr. S. J. Baldwin, Bromley, Kent, for his catalogue, which contains enough information to fire the ardour of most novices, and make them wish for more. The ¼-in. space at the ends of the frames is to permit the bees to pass between them and the hive side. There is a somewhat greater space at the bottoms of the frames to allow of the bees running freely on the floor. There is ½ in. between the surface of the combs, and between the edges of the top bars of the frames which gives room to work and allows of access to the super. I trust E. H. will be very successful in his bee keeping. I know that to me the pursuit is full of interest, and impresses upon me most forcibly the wisdom of the Creator.—APIS.

Lathe Matters.—A B C D (*Tooting*).—(1) Patent metal is an alloy containing ten parts of tin, one of copper, and one of antimony, but the proportions vary slightly in different specimens. It can be bought for about 1s. a pound from any large tool merchant, and A B C D had better get it this way rather than attempt to make it. (2) A straight piece of iron with a screw at both ends and two nuts, might mean almost anything. It could be made to act as a mandrel if everything was the proper shape. The great point to aim at is to have the wear capable of being taken up, which can only be managed with a cone or split bushes. (3) The speed ratio of a wood turner's lathe ought to be eight to one, therefore the pulley will be ⅛ of the diameter of the driving wheel, in your case 1½ in., which will be very small. You can expect to turn only light work in such a lathe. I will be glad to help you at all times, and quite agree with your good opinion of WORK, which only echoes my own.—SELF HELPER.

Gas Engine for Lathe and Dynamo.—H. H.—As your lathe is only 3½ in. centres, you do not require any motor; but if you want one for the fun of the thing, the simplest way to connect the two is to have a pulley on crank shaft of lathe, and let the strap run from gas engine on to that; leave treadle as it is so that you can use it if you wish to retard or accelerate the motion, or to drive backwards, the belt being thrown off the while. Of course the proper way would be to drive the lathe by a shaft above, with striking gear and crossed belt, for stop, start, reverse; but this involves a good deal of expense. You are sure to have hitches and trouble with the gas engine, and will not have such complete control as with the foot on treadle. I think you could get a second-hand Bisschof engine from Crossley's, Manchester, of 1 man power for £7. Cuttress & Co., Leeds, are good makers of dynamos, etc.—F. A. M.

Price of Lathe, etc.—S. F. W. (*Edinburgh*).—(1) You will find the answer to your first question in the second number of WORK, pp. 18 and 19. (2) I do not know anyone in Edinburgh who would test a lathe for you. Any really competent turner should be able to do it; a foreman of turners from some engineer's for a metal turning lathe; as to the necessity of having it tested, that depends on whom you buy it from. (3) A 6-in. centre lathe need not be too heavy for an amateur to use, it would depend entirely on the construction, chiefly on the size of the mandrel necks and the way it is speeded.—F. A. M.

Trade.—W. H. (*Rainhill*).—There is nothing at present in WORK that is exactly in your line of business, and we can hardly advise you to take the course you indicate. That is always a grave step, which should only be taken under exceptional circumstances. We should advise you to stick to the vice, and if need be, get into another shop where by arrangement you could be occupied also at lathe work. Perseverance—pegging away in your present groove will probably ensure you a better income than making a change.—J.

Holes in Mahogany.—G. P. (*Islington, N.*).—If you cannot saw the holes in ½ in. mahogany accurately enough for your purpose with a fretsaw, you might, perhaps, do so with a stouter saw, a keyhole or pad saw, or you might get a circle cutter, which is a tool fitting in the joiner's brace, having a strong point which forms the centre; this has passing through it a steel bar which carries a cutting knife like that of a cutting gauge, only stronger. The bar is fixed at any desired point by means of a small thumb-screw, and the cutting knife is also fixed in a similar manner. I have drawn mine and another form of a similar tool. G. P. will find it is not the easiest of all tools to use; it must be held so that the knife touches the wood equally when the centre has made itself a hole, which will not be if the tool is held aslant. As to silicine glass painting, see No. 40 of WORK, front page.—B. A. B.

Bicycle Oil.—CYCLE SUPPLY CO.—I am not much acquainted with the make-up of lubricating

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oils. For cycles I use bleached sperm oil: six of sperm to one of paraffin. A lot of information about lubricating oils will be got in Spon's "Recipes," pp. 334, 373, 374.—A. S. P.

Patent Penknife.—PENKNIFE.—We have examined the sketch you sent us, and it seems to be ingeniously contrived, and will, no doubt, answer the purpose you intend it for. We don't quite understand the object of the two wing or side pieces which open, nor do you give us any explanation of what they are intended for. Is it to give a better hold for the hand when they are opened out?—C. E.

Expansion Engine.—EXPANSION.—To answer this correspondent would involve *designing* a triple expansion engine and boiler and propeller. I should refer him to A. E. Seaton's "Manual of Marine Engineering;" all particulars are given in that, and when he has studied it for a month or so he will be able to essay the design he contemplates.—F. C.

Cooking Stoves.—J. P.—Having had considerable experience in the use and also in the fitting up and fixing of the class of stoves you inquire about for cooking, I can speak with some degree of confidence as to their merits, but it would be a difficult matter (almost as difficult as to pick out the best make bicycle) to say which is the best, there are so many; some excel in one point, some in another. The points to be considered in choosing a stove of this class (self-contained) are briefly as follows:—It should possess a good-sized oven, and the oven should not only be a good size as regards the width of it and the depth from back to front, but should be a fair height. It should also possess a boiler, either wrought-iron or copper. The top or hot plate should be capable of accommodating at least three good-sized saucepans. The fire should not be too small, and should, if possible, present sufficient surface to the front to allow of toasting or grilling. The arrangement of flues and dampers should be simple and easy to get at. I could name a dozen makers whose stoves fulfil most, if not all, of these conditions, but two or three will suffice, and a perusal of their lists, which they send free, will give J. P. fuller information. They are Messrs. Dobbie & Forbes, Larbert, N.B., Grove & Sons, Leamington, and Brown & Green, Luton, Bedfordshire, and Finsbury Pavement, London. I am constantly fixing these ranges, and never have a complaint, except occasionally through the foolishness or carelessness of a servant who has been used to the old-fashioned and wasteful kitcheners, and "don't like them new-fangled things." The stoves made by Dobbie & Forbes are the "Larbert," "Hanley," and "Livingstone." The "Livingstone" is my choice; it is a good-looking range, fulfilling all the requirements I have mentioned, and no better working range could be wished for. The "Larbert" is somewhat similar in principle, but cheaper. Groves' ranges are more in appearance like the ordinary kitchen range: they have a large oven, but a small boiler, and are moderate in price. Brown & Green's stoves are called the "Gem." They are a very plain-looking range in the smaller sizes, but will cook splendidly, and the small consumption of fuel is something astonishing. With regard to parlour stoves, I recommend an "Abbotsford," or one of similar class—viz., slow combustion: that is, with no grating in the bottom. And with regard to washing machines, I do not know the "Torpedo," but should think from the name it was one of those zinc affairs to stick in the copper. If you have gas available, try Fletcher's "Quick" washer; it is about the best thing I know of, and the most economical. Hope these hints may prove useful.—R. A.

Fern Case.—RUPERT HOW.—Fern cases have not yet been treated upon in the pages of WORK, but an article on a "Wardian" case is in the hands of the Editor awaiting space, and further designs will appear when possible.—C. M. W.

Aquarium Leak.—AQUA.—You can stop the leak in your aquarium by coating the joints with copal varnish, thickened to a creamy consistency. Let each coat be quite dry before putting on another. This, of course, is assuming the aquarium is otherwise sound. If it is badly made and improperly glazed, no composition will do it any good. If you do not succeed, write again, giving full particulars as to construction.—C. M. W.

Volumes of WORK.—S. J. (*Stockport*).—The price of Vol. I. of WORK, already published, is 7s. 6d. bound. Succeeding volumes will be the same price. You and all who do not do so should write separate questions on separate sheets of paper. One man does not answer such divergent questions as yours on Blast Pressure, Price of WORK, and Gold Wedding-Ring Making. Every subject is answered by a distinct authority thereupon.—C.

Modelling.—GAMMA (*Nairn, N.B.*) must not allow his clay to "dry and crack up." When he is not working his model must be wrapped in wet cloths, and if left for any length of time, waterproof should be put over all. To prevent cloths from rubbing a delicate model, wooden skewers should be stuck into it. If the model dries while he is working on it, he should sprinkle water over it—blowing the water in a cloud of spray from the mouth is the best way. When finished, the model should at once be cast. With regard to modelling wax, let him read our recent reply to LOVER OF WORK. Any large dealers, such as the Stereoscopic Company, Regent Street, London, will be sure to have abundance of photos of sculpture. Why should he not communicate with such a house, and learn their terms?—M. M.

Strain on Rings.—G. L. (*Liverpool*).—A radial strain acting on a ring towards its centre causes a circumferential crushing strain equal to the pressure per inch of circumference multiplied by radius in inches. Boiler rings usually fail by distortion because the resistance of the material is not absolutely uniform. So long as the pressure is radial the same formula will apply to arched girders, but if the loads on the girder are vertical the case is different, and moments of bending stress are set up which are calculated in the same way as for a straight girder.—F. C.

Bicycle Repairs.—LONG CRANK.—1. Handle bars may be bent hot or cold. With makers who have rolling machines the process is easy. In the absence of rolls they, if the bends are slight, may be heated and bent over the horn of an anvil; this process ovals the bend somewhat, but careful hammering will put that right. They may also be bent cold by filling the part with lead, and applying the pressure of a screw. In the absence of the proper rolls, I use a screw cramp with which I bend tubes either hot or cold, quick bends being always heated. The instrument in question will be understood from the annexed sketch. A is a straight bar with a screw passing through the centre, said screw being turned by the cross T handle, B. C C are two arms hooked on to the bar, A, and carrying at their ends cast-iron blocks, which turn on the through pins, D D. The point of the screw is armed with a similar block only it is curved on the face. The tube, E E, is placed in the cramp as shown, the three blocks having deep hollows into which the tube fits, each size of tube requiring a separate set of blocks. It

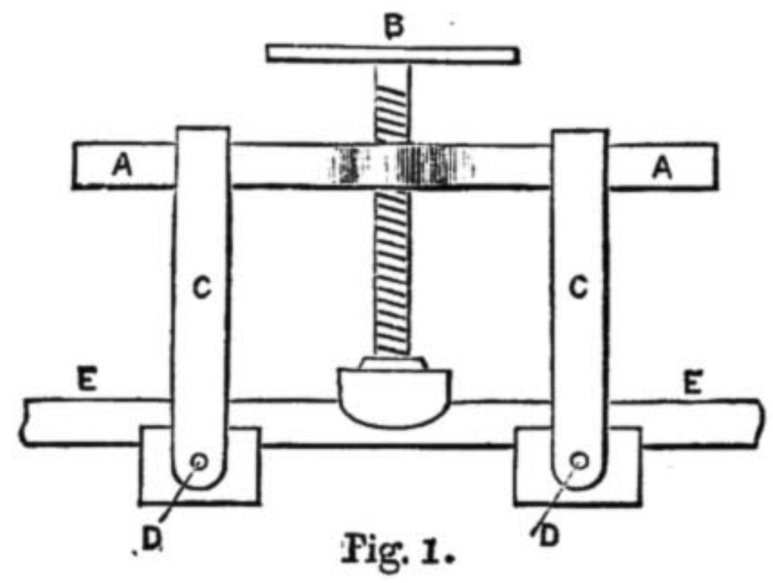

Fig. 1.

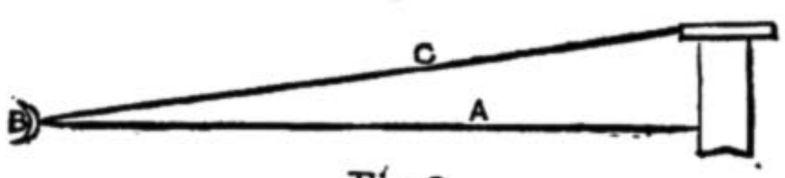

Fig. 2.

Screw Cramp.

will be readily seen that pressure upon the screw will very easily bend the tube. The arms, c c, are movable along the bar, and for quick bends they are placed nearer to the centre screw. 2. The gauge of tube for semi-racing bar is 18 B. W. I., for ordinary roadster, 16 B. W. I. 3. Hubs are divided with a division plate on the lathe or the drilling machine. To divide and drill a hub on the lathe without the division plate you have got to find the places for the number of spokes with small dividers, then centre punch the marks, taking care to have the marks on one flange, midway between those on the other. In drilling, the hub is held against a wooden pad, and led to the drill with the sliding headstock. This pad is a thick block of wood with a deep hole fitting the sliding mandril nose and bevelled to the extent required, for the angle of the spokes. The block is long enough to pass down between the shears of the lathe, and has the narrow end uppermost. To find the proper bevel of this block draw the line *a*, Fig. 2, through the centre of the hub; draw the section of rim at *b*; from *b* draw line *c* to flange of hub. The centre line and the spoke line represent the two faces of the pad and give the correct angle for boring.—A. S. P.

Cheap Clocks.—G. V. (*London, S.W.*).—Try the British United Clock Co., 34, Farringdon Road, London, that is the London office, their works being at Birmingham. Also for foreign try J. J. Stockall, 6, and 8, Clerkenwell Road, London. From these you can get all you require. I should think one is maker, the other importer.—A. B. C.

Painting Bicycle.—BICYCLE.—Clean off all rust and smooth down rough places with emery cloth or glass paper, then give a coat of best black japan, to be had of most oil and colour merchants. It will be all the better if you can heat the parts at a fire and apply the japan while the parts are hot, with a soft camel hair brush. If it is not properly covered, or some parts appear brown through one coat, give it another. This will dry in about an hour and will wash well.—A. S. B.

Condenser for Coil.—INDUCTION (*Tewkesbury*).—You appear to have prepared the paper all right. Are you quite sure it is free from flaws? A mere pin-hole will spoil the effect. The sheets of tinfoil are also of the right size, and are rightly arranged. You do not give the size of your coil, or I could have told you how many sheets of tinfoil to use. From the size of the sheets I suppose it to be a small coil, and, in this case, from twenty-five to thirty sheets will be sufficient. The whole, when built up, must be tightly pressed together, and the respective slips on each side should be all lightly soldered together to each conductor. The wires from these will go, one to the foot of break spring, and the other to foot of contact pillar. The condenser is placed under the coil, in the stand of the instrument. I hope to deal with the subject more fully in my articles on "Coils."—G. E. B.

Electric Belt.—W. M. (*De Beauvoir Town*).—The most correct method of connecting the discs is considered to be as follows:—Arrange the discs in two parallel rows with c and z alternate in both rows, and also in their relation to each other. Connect the two rows together, the c of one to the z of next, and so on, leaving a zinc plate free at one end and a copper plate at the other. I don't see how the effects claimed can be produced, and am not personally acquainted with any person who has been really benefited by these appliances. The only relief experienced by my acquaintances has been felt in the pocket.—G. E. B.

Inlaying, Imitation of.—J. B. (*Londonderry*).—I believe there is some such process as you suggest, which was patented some time ago, but I do not know that it has ever been more than a partial success. I am not acquainted with the details of manipulation, so am unable to tell you how to overcome the difficulties which you think likely to occur. If you want imitation inlays, paint them, and then you will run no risk of infringing any patent. Stencilling may be an assistance up to a certain point, but you will not be able to manage fine work by this means. If you think your idea of a process for imitating inlays has any advantage over others, the best advice I can give you is to experiment on your own account. Were I to do so, and find out or perfect some new and commercially useful method, I am afraid the temptation to patent it, instead of publishing it *pro bono publico*, would be too strong for my philanthropy to overcome.—D. A.

Silvering Glasses.—R. H. (*Accrington*).—See what has been said in recent numbers of WORK on this subject. If you had read "Shop" carefully you would not have had occasion to put your question. No one on the staff, from the Editor downwards, objects to answer reasonable questions, but valuable space cannot be wasted by repeating instructions which have been given only a week or two before. The process is not suitable for amateurs, who cannot possibly do the work either so well or so cheaply as they can get it done for them. Read the answer to W. K.—D. D.

Walnut Stain, etc.—A. B. (*Bradford*).—It is not absolutely necessary to use ammonia in the walnut stain, but it is better to do so. You do not require much of it, only sufficient to make the vandyke brown into a paste. The smell will soon evaporate, and I can hardly see how it can be objectionable if you let the stain stand for a few days before using it. If you like you may substitute caustic soda or potash for the ammonia, but against them also objections may be urged. It is, however, a matter of opinion, and you will find good workers using both materials. The chemicals required to dissolve bichromate of potash are hydrogen and oxygen, of which a combination forms the liquid sometimes known as *aqua pura*, but more commonly called water.—D. D.

Soldering Tinware, etc.—AMATEUR.—If you have only just commenced to take in WORK it is, I think, hardly fair to it to criticise it unfavourably on reading a number or two. It also accounts for your not having seen the articles on "Soldering" which have already appeared in Nos. 19 and 23, where you will find some information which I think even you will not say is "too much advanced," as it is put in a form that any one with ordinary faculties can comprehend. Further information and instruction in the various branches of tin, zinc, iron, etc., will appear as time and space will permit.—R. A.

Venetian Blinds.—RACHET BRACE.—This subject cannot be explained in "Shop" as it would occupy the whole of it. I will with pleasure write an article on the subject, of which I have had practical experience. RACHET BRACE asks for addresses of those who supply materials; to do this would be difficult without incurring a charge of unfairness, and impossible unless he tells us where he resides. Please to give some idea of your appliances and capabilities. If every querist would give fuller particulars it would be better.—B. A. B.

Self-feeding Fountain.—C. E. T. (*Liverpool*).—Your want of a fountain to feed itself is a very common one; but it is, nevertheless, unattainable without a cistern, or some other form of supply. An ordinary hydro-pneumatic fountain could be successfully applied to the design you mention; but the full particulars and instructions could scarcely appear in the limited space of "Shop." An article on this kind of fountain appeared in WORK, No. 69. This will probably suit you.—C. M. W.

Aquarium.—S. R. G. (*Liverpool*).—1. If you cannot get the dish you require as a dish, buy a cheap flower stand, say about 1s. 6d., and use the lower part; if you do not succeed in this, you can order through a gasfitter or ironmonger, what is known as a glass consumer for hall lamp, with a hole in centre; these are made in sizes from about 7 in. to 12 in., and are quite plain, and would suit

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the purpose admirably; cost about 1½d. per inch diameter. 2. Enamel paint will not injure the fish when quite dry.—C. M. W.

Litho Printing, etc.—REGULAR SUBSCRIBER (*Leeds*) does not comply with any of our rules. He asks three questions on one sheet; he does not give his name and address (not for publication, but for the information of our Editor); whilst his queries are not in any sense particular, but general, as "How the method of lithographic printing is executed?" In reply to this I can only refer him to "Richmond's Grammar of Lithography" (Wyman's Technical Series), 5s., of any bookseller, or direct, 65, Chancery Lane, E.C., as my space is utterly inadequate to give even an outline of the process. 2. Recipes for all sorts of transfer ink, transfer paper, etc. etc., will be found and are thoroughly reliable. 3. Show cards are glazed in various ways. The glassy brilliant finish of some is done with gelatine in ovens constructed for the purpose. Another method is to size the card or paper with isinglass dissolved in water (or sometimes in methylated spirit), and then after two coats at least, when perfectly dry, varnish with pale copal, mastic, or paper varnish very thinly laid on. Paper varnish consists of a gum or gums dissolved in spirit, and dries with a good bright lustre in a few minutes. Still another mode is to pass the cards or sheets of paper after printing through a calender, *i.e.*, hot rollers, several times under great pressure, which gives smoothness and gloss, slightly inferior to the others, but at a cheaper rate. I have mentioned these processes in their order of brilliancy.—J. W. H.

Banjo Making.—W. H. R.—The metal for banjo hoop is brazed, mounted in the lathe, and the edges are spun over a steel wire. You might manage to turn over the edges to your own satisfaction without a lathe. The inside of hoop must have a wooden lining to get the best results. An ordinary wooden banjo hoop will do. If you want to tune your banjo to concert pitch, the best length of fingerboard for a 12-in. hoop will be 18 in. long, not longer, and the strings used must not be too thick. Professionals generally have their banjos made with a 20-in. handle, but tuned a note lower, therefore when playing with piano accompaniment the piano part has to be written a tone lower to harmonise with banjo. See reply to J. K., how to put on vellum. Nickel plating would cost about 2s. or 2s. 6d. for hoop and band. Screws and brackets can be had from the various music shops; the best are only to be purchased from banjo makers of note, who use only the best. The best way for you to do would be to write to two or three makers asking for prices; living in London you will no doubt know the addresses of several. Do not purchase cheap brackets or your banjo will be a complete failure.—J. G. W.

Artist's Easel. — ELEPH. — A full description with working drawings of a studio easel as required by you would occupy three or four columns of WORK, and I shall be prepared at some future time to supply the requisite information should our Editor so desire; but for the present I should advise you to write Messrs. Winsor & Newton (Limited), of 37, Rathbone Place, London, or Messrs. G. Rowney & Co., of Percy Street, Tottenham Court Road, London, for their illustrated catalogue of easels; or in your own city, Edinburgh, go to Messrs. Doig & McKachnie's, the Art Galleries, 90, George Street, and frankly ask either of those gentlemen, who are most kind and courteous, to show you one, which I am sure they will do.—F. B.

Small Billiard Table. — INQUIRER. — The best article for a small billiard table bed is slate. It should be about ½ in. thick for a 4 ft. by 2 ft. table. The cost would be about 12s. The cushions should be stuffed with india-rubber, and the india-rubber will cost about 6s.; you will buy a 4 ft. billiard table cheaper than you can make one, and have it perfect, for 70s. complete.—G. E.

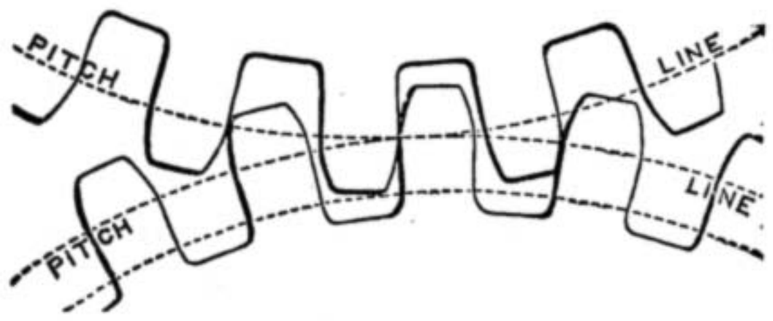
Brazing Bandsaws.—A. C. (*Old Ford, E.*).—The jaws of the tongs used for running the spelter, that is the bright hot tongs, should be from 1½ in. to 1¾ in. wide and about ⅜ in. thick; the reason for having these tongs so heavy or thick is to hold the heat, and when once heated, if you have several saws to braze, and have a good fire, by placing the tongs in the fire as soon as slipped off the saw, it will be ready to put on the next saw by the time you get it in position for brazing. The second tongs need not be so heavy, but about the same width; these tongs are used to close the joint and to prevent the spelter running out, and to a certain extent temper the saw where it is joined, for you must understand that the saw may be made hard or soft as the second tongs are cold or hot. By using a rest, as described in Vol. I., No. 36, page 571, of WORK, or some such device, no wire will be required. While you are messing about the wire the braze may be made. If you refer to instructions given in back numbers, and work accordingly, you need not fear making a good braze in your saws.—A. R.

Blast Pressure.—S. J. (*Compstall*).—To measure the pressure you should attach to the blastpipe a gauge. Many of these are on the market. If you wish to make one yourself, a syphon tube form would be the best to adopt. In regard to delay in replying to you, you, as a constant reader of WORK, must observe that our most strenuous efforts will not be sufficient to answer every correspondent as quickly as we wish.—F. C.

Human Body. — FRENCH POLISHER. — Get through your bookseller "Human Physiology," published by Cassell & Co., London, E.C., price 7s. 6d.

Bicycle Matters. — CYCLIST. — (1) About the best black enamel for bicycle short of stoving is the "Club" special hard-drying enamel, sold by the Silico Enamel Co., 97, Hampstead Road, London, N.W. (2) There is no good thing for retouching bare plated parts; plate over again is about the only satisfactory way. Unsightly parts may be made to look better by careful polishing with emery cloth, then coat with Silico transparent colourless enamel. (3) For rubber soles use Brown Brothers (late Snell & Brow's) rubber cement for mending rubber cuts. The two surfaces must be thoroughly cleaned; then coat both all over with the cement and leave them aside (separate) for, say, two hours; then stick evenly together and press. They won't come off.—A. S. P.

Mechanical Drawing. — AN ADMIRER OF "WORK" (*Otley*). — The cheapest works on this subject are those in Weale's Technical Series—a list of which can be seen at almost all booksellers'. You will be readily able to select those you most want, and as you progress and discover your own deficiency of information you can order others more advanced. Computation of speeds is quite simple. Given the speed of any main shaft, say 120 to 150 revolutions per minute, you can put a drum upon it, say, 2 ft. 6 in.; then to obtain slower speed make the pulley of the machine larger than the drum; to gain speed it must be smaller; the proportions are ascertained by the rule of three, but in nine out of ten cases can be done mentally. Thus, for instance, main shaft, 150 revolutions, machine, 300 revolutions, drum, 3 ft., it follows that the pulley must be half that, so that it may go round twice to every revolution of the drum, *i.e.*, 18 in. Again, tooth wheels, spur wheels on shaft, 100 revolutions, 4 ft. in diameter, speed required, 400 revolutions; no matter what pitch or number of teeth (which depends entirely upon the h. p. to be transmitted), the diameter of the pinion must be one fourth, so as to compel it to revolve four times to the spur wheel once, *i.e.*, 1 ft. diameter. Of course by diameter of a toothed wheel it is always understood to be measured to the pitch line—*i.e.*, a line which (theoretically, though not practically) is the mean between the top or periphery of the teeth, and the bottom, and which, when in full gear with the pinion, is identical in both wheels, thus—



Pitch Line of Tooth Wheels.

You might obtain a wheel list, which is well worth study. Having made a special study of printing machinery, and patented many improvements therein, I shall take a special pleasure in explaining to this correspondent in "Shop" any of the many difficulties which he is certain to encounter in the career he has chosen if he will write to our Editor, asking the advice of J. W. H.

IV.—QUESTION ANSWERED BY A CORRESPONDENT.

Nitric Acid Guard.—R. A. (*Salisbury*) writes in reply to ACID (see page 262):—"Let ACID line a wooden tray thickly with gutta-percha: this will resist strong nitric acid; or your existing bad tray might be lined with it, but I always thought that lead would stand. Have you got solder anywhere? if so, this would eat away. The joints (if any) should be what plumbers call 'burnt' together. Autogenous soldering is the proper term."—R. A.

V.—BRIEF ACKNOWLEDGMENTS.

Questions have been received from the following correspondents, and answers only await space in SHOP, upon which there is great pressure:—P. C. B. (*London*); H. W. (*Surrey*); L. & L. (*Cambridge Heath*); C. G. (*Camden Road*); F. P. (*Hoxton*); F. M. (*Maldon*); F. S. (*Kidderminster*); C. M. (*Perth*); A. F. R. (*Birmingham*); J. B. B. (*Sutton*); F. H. (*London, N.W.*); A. J. K. (*Sheerness-on-Sea*); H. C. (*Islington, N.*); I. J. (*Shipley*); W. H. M. (*Glasgow*); J. A. P. (*Preston*); O. L. (*Birstall*); P. F. (*Govanhill*); A WEEKLY SUBSCRIBER; W. R. S. (*Stratford*); G. R. (*Dorchester*); R. W. M. (*Kildare*); J. B. (*Burton-on-Trent*); C. C. (*London, W.C.*); CARNGORM; E. G. (*Forest Gate*); A. J. T. (*Islington*); G. R. R. (*West Calder*); W. H. M. (*Glasgow*); A. H. W. (*Bath*); J. J. C. (*Staffs.*); AN AMATEUR; P. H. Z. (*Hammersmith*); R. T. (*Blackburn*); W. B. (*Huddersfield*); A PLAYER; J. D. (*Birmingham*); O. B. (*Preston*); A. A. (*Richmond*); J. M. B. (*London, S.W.*); G. S. (*Stockton-on-Tees*); H. P. (*Maidstone*); COOPER; M. & C. (*Grimsby*); H. R. H. (*Forest Gate*); CHURCH MANUFACTURING CO.; R. K. (*Burnley*); NERO: J. B. (*Pontefract*); MONA; W. T. S. (*Burnley*); LATHE SPEED; B. X. E. (*London*); H. W. (*Strabane*); GATKSHEAD: OX GALL; F. L. (*London, N.*); F. R. (*Ashford*); J. W. (*Middleton*); M. A. E. S. (*Bristol*); MUSICUS; W. R. P. (*London, N.W.*); T. L. P. (*Liverpool*); R. W.; J. S. (*London, N.*); J. K. (*Mile End*); S. H. H. (*Brighton*); T. L. P. (*Liverpool*); F. S. M. (*United States, America*); A. W. (*Edinburgh*); A. P. (*London, E.*); J. S. (*Norwich*); W. B. (*Preston*); L. & L. (*London, E.*); H. A. H. (*Manitoba*); F. J. (*North Finchley*); R. G. & Co. (*London, N.*); H. P. (*Didsbury*); H. W. (*Wallington*); W. F. (*Mile End*); J. S. (*Monmouth*); J. C. (*Seacombe*); AMATEUR VIOLINIST; C. F. F. (*Islington*); S. R. (*Ireland*); A. Ch. B. (*Norwich*); R. J. A. (*Seacombe*).

"WORK" EXHIBITION.

(1890-91).

For Classification, Prize List, etc., see WORK No. 70.

IMPORTANT PRIZE COMPETITION IN CONNECTION WITH THE ABOVE-NAMED EXHIBITION.

The Publishers of WORK have much pleasure in offering the following Prizes for Designs for the Medal and Certificate of Merit, to be awarded to Successful Exhibitors in the various Groups and Classes as set forth in page 290 (No. 70) of this Magazine:—

For Design for Medal.

FIRST PRIZE	Two Guineas.
SECOND PRIZE . . .	One Guinea.
THIRD PRIZE	Half-a-Guinea.

For Design for Certificate.

FIRST PRIZE	Two Guineas.
SECOND PRIZE . . .	One Guinea.
THIRD PRIZE	Half-a-Guinea.

If any Competitors wish to submit a Model in Clay, Plaster, Wax, etc., as a Design for Medal instead of a Drawing, they are at liberty to do so.

Competitors should send in Drawings or Models not later than September 30, 1890, addressed, carriage (or postage) paid, to

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LONDON, E.C.

Prize Competition.
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A Motto must be affixed to each Drawing, and the name and address of the sender enclosed in a sealed envelope bearing *the same motto*, which must be transmitted by post, under cover, to the Editor of WORK.

The Drawings sent in Competition will be submitted to three competent judges, who will select those that are considered most worthy of prizes.

The Prize Drawings will become the property of Messrs. CASSELL & COMPANY, Limited, who will return all Designs made by unsuccessful competitors to their respective owners carriage paid.

The Awards, with the names and addresses of the successful competitors, will be announced in WORK in due course.

For further particulars, all intending competitors should apply to the Secretary, "WORK" Exhibition, CASSELL & COMPANY, Limited, as above.

Trade Notes.

THE following is given as the railway mileage at the beginning of 1889:—Europe, 133,900; America, 190,000; Asia, 17,800; Africa, 5,200; Australia, 10,500; total, 357,400, as compared with 293,000 in 1884. Of the increase of 64,000 miles during the four years, 40,000 is in America and 30,000 in the United States alone; 11,000 miles were opened in 1885, 17,000 in 1886, 23,000 in 1887, and 13,000 in 1888.

THE Armourers' and Braziers' Company will hold, at their hall, in the City of London, in May, 1891, a second exhibition of art brass work of original design, the work of British subjects, manufactured since 1st January, 1889. Prizes and certificates will be given to designers, craftsmen, apprentices, students, and amateurs respectively. Particulars may be obtained by forwarding an addressed envelope to the undersigned. Marshall Pontifex, Clerk, Armourers' Hall, 81, Coleman Street, E.C.

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One Page	12	0	0
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Quarter Page	3	13	6
Eighth of a Page	1	17	6
One-Sixteenth of a Page	1	0	0
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Tools, Tools, Tools.—The cheapest house in the trade for English and American tools is LUNT'S, 297, Hackney Road, London, E. Send stamp for reduced price list. [6 x

Fretwork, Carving and Repoussé Work.—Catalogue of all requisites, 700 illustrations, 6d. each.—HARGER BROS., Settle, Yorks. [13 x

Victor Cycle Co., Grimsby, sell Mail Cart Wheels. [14 x

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arrangement of straight lines; yet, when the thing is made no one seems to think it so very plain, after all. Why? Simply because the texture—if I may so call it—of the smooth flat surfaces is not monotonous. As we ourselves alter our position, so does the quality of the colour vary. But perhaps some may say, If the thing is black, it always looks black; and, without contradicting them, I would merely suggest that they should make a practical trial with such a thing as an ebony round ruler. True, it is black, but a long line shows white, or it may be only grey if the polish is dull and the light the same; still, whatever it is, it is lighter in appearance than the part which is in the shade or away from the light. You don't see it: you don't see the light, I mean. But surely you see the shine in one part? Yes. Well, that is the reflected light, which I claim plays such an important part in all plain furniture. Call it shine or reflection—it does not matter which—the fact is the same. Even if we would, we cannot—even in such artificial things as articles of furniture—annul the beauties which Nature lavishes on us, though we may ignore them through mental blindness—or, worse, through wilfully refusing to see them. Instead of acknowledging that the chief charm about a plain undecorated wooden contrivance is due to the natural effect of light, we are, perhaps, rather too apt to attribute it to the artistic skill of the designer. I sometimes think we strive rather too much after effect in our furniture, and so, by our efforts, defeat the ends in view. However, this is merely a suggestion, which, though it is quite consistent with the fact that plain furniture is not often considered ugly—indeed, more often is considered æsthetic (I use the word in its true sense)—may not meet with universal approval; but I trust enough has been said to show that the bookcase in question is agreeable to look at. Of course, tastes vary, and it is not to be expected that it will please all; but remembering that the furniture described is, as the title states, easily made and cheaply produced, no great scope is available for mere decoration. This must give way to utility and soundness, for, whatever else is sacrificed, these two qualities should not be. It is owing to neglect of this fundamental principle that we see so much bad work. There is too much attention paid to mere ornament, and too little to honest construction. Of course, ornamentation is all very well in its way, but the cost of production is increased thereby, so that, when decorative details are a *sine quâ non*, something must be sacrificed. Unfortunately, this something is too often structural. In the bookcase under consideration nothing whatever has been thrown away on decoration. It is simply a useful piece of furniture, which its very homeliness invests with an attraction not always found in more pretentious work.

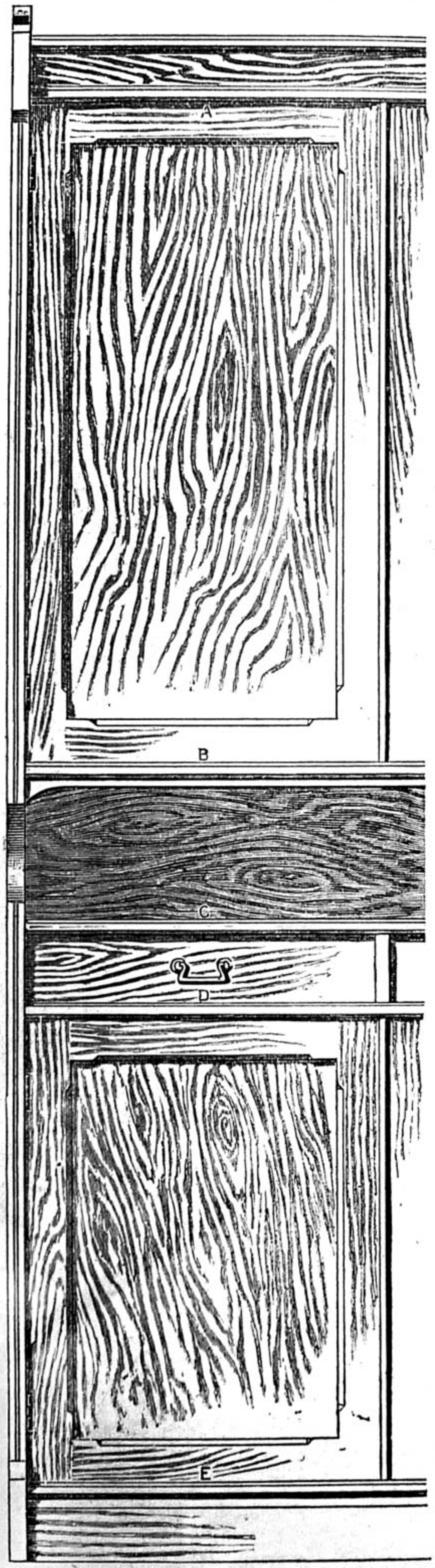

Fig. 2.—Front Elevation (letters show corresponding parts. Scale 1 in. = 1 ft.).

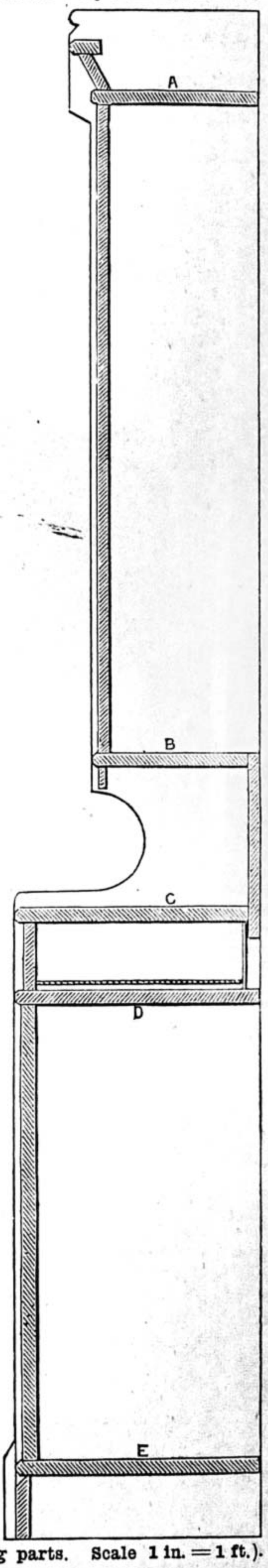

Fig. 3.—End Elevation.

By Fig. 1, which represents the bookcase pictorially or in perspective, it will be seen that the ends are flush from top to bottom; there is no cornice at the top, nor plinth at the bottom, projecting from them. The reason for which is, that the bookcase was originally made to fit into a recess, and cornice or plinth would have prevented its ends fitting close to the wall at the sides. As much space as possible was wanted in the bookcase—or, in other words, it was wanted as large as it could be. To have made a cornice in the usual way would have rendered it necessary to reduce the width of the carcase, or body, of the case some three to four inches. By adopting the straight ends, this additional space is gained, and, moreover, a piece of furniture made so can be closely fitted within the space intended for it. A bookcase made in the ordinary way with cornice might be placed within a recess, but can scarcely be said to fit. But perhaps it may be thought that such a formation at the top would be unsightly if the bookcase is to be placed against a flat wall instead of in a recess. If so, I can only say that the appearance is merely a matter of opinion, and that, personally, I see no reason why a bookcase or similar piece of furniture—such as a wardrobe—should have, of necessity, a moulded cornice on the ends. Those who think they would like to have a cornice will have no difficulty in forming one according to the method described for the overmantel shown in Vol. I., page 25. If, by the way, the two things are to be in the same room, it will be just as well to keep to the same general features in any cornice that may be adopted.

In the meantime, as it is the earnest endeavour that this series of furniture should be as widely useful and suggestive as possible, let it be supposed that the bookcase is to be made as described. If any worker of average intelligence should then be unable to modify details according to his special liking or the necessity of individual cases, it will, probably, be owing to his not having given sufficient attention to the subject.

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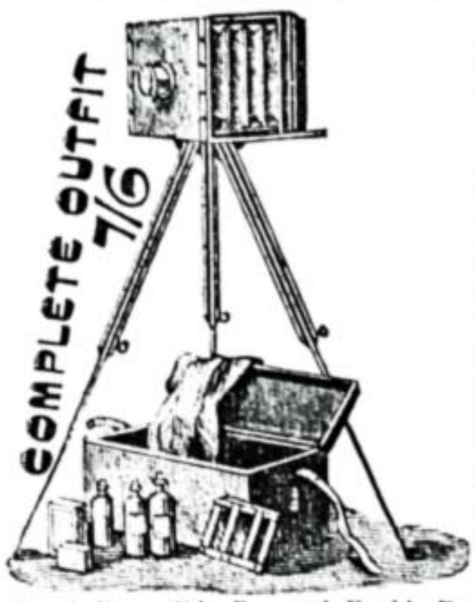
AMATEUR PHOTOGRAPHY.—J. H. SKINNER & CO., *W Department, East Dereham, Norfolk.*



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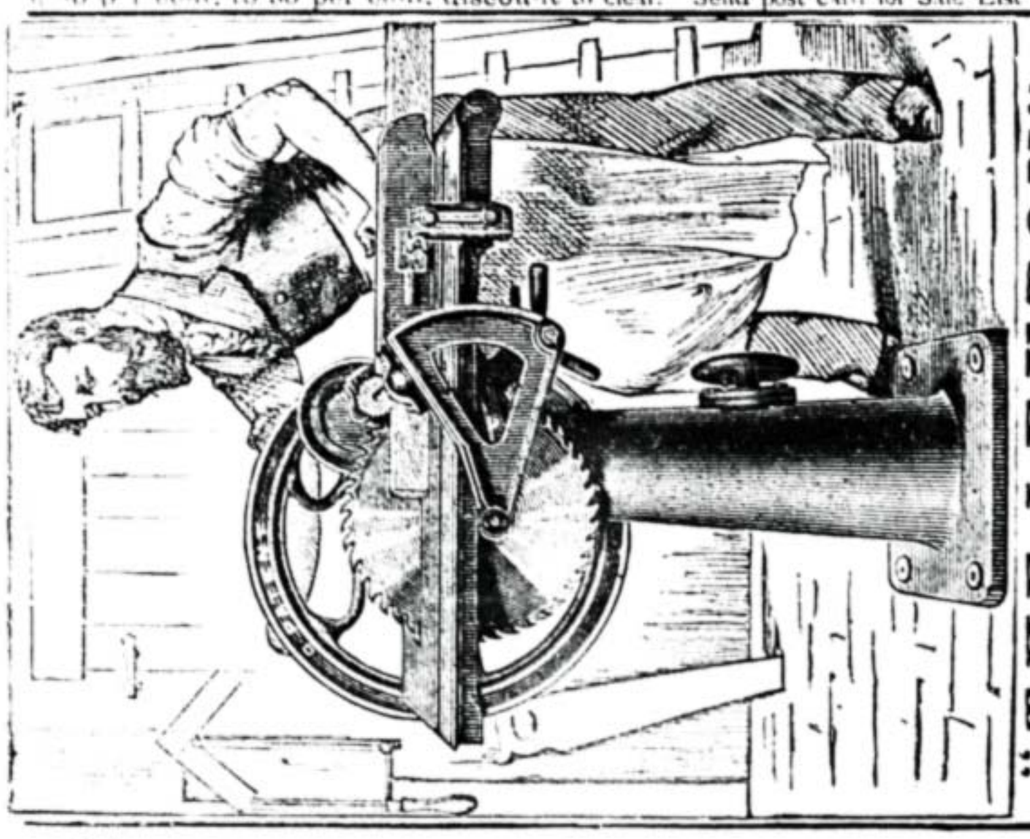

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An Allowance of 10 per Cent. *in goods* will be made on all mixed orders for Wood, small Tools, Saw Blades, and Designs, amounting to 10s., and **15 per Cent.** on orders amounting to 20s. and upwards. NOTE.—*This reduction does not apply to Treadle Machines.*

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